POPULAR Computing WEEKLY

35p 16-22 February 1984

BRITAIN'S BEST-SELLING MICRO WEEKLY

Computer Swap 01-437 4343

Free readers entries to buy or sell a computer. Ring 01-437 4343 and give us the details

DRAGON 32 demo cartridge wanted or any defective or faulty cartridges. Ring Staines 58707 after 6pm

WANTED, Spectrum 16/48k or Commodore 64. Exchange for Philips or most video cartridge recorder, many blank tapes and 2X81 16k. Please phone Rustington 43511 (West Sussex)

WANTED, Spectrum 16k or 48k for £100 Tel Brighton 203479 (?????)

DRAGON 32 games program for swap or sale Tel 031 339 5790 (after 6pm)

WANTED 64 or Sharp MZ711 or Atari 600 XL with c.recorder Maxim Party £165 Tel 0788 205198

WANTED, compatable track ball for Commodore 64 will give Atari track ball in exchange Tel 01-840 3810

News Desk

MoD bans software protection

A BARNSLEY-based cassette duplication company has come up with an answer to the problem of software piracy. Yet the technique may never be used by software houses to protect their programs.

JLC Data has patented a unique system which prevents not only commercial piracy, but also home tape-to-tape copying. However, the patent has had to be withdrawn and the idea shelved following a secrecy order which was served on JLC by the Ministry of Defence.

"We have had the secrecy order placed on us which spells it out in plain English" — explained JLC's Jim Lamont. "I can't tell anybody about it on pain of imprisonment and heavy fines.

"I must package up all information relating to the research we have carried out in the past eight months and send it to them. It must all go in an envelope marked 'secret' which is in turn put inside another envelope and then be sent by registered post to the MoD. It is all cloak and dagger stuff."

continued on page 5

GEC breathes new fire into Dragon

DRAGON'S intention to diversify its range of products will mean a change of emphasis for the company.

A plan worked out by managing director Brian Moore will shortly expand the company's activities into business micros.

Last week Dragon relinquished marketing and distribution responsibilities to a GEC subsidiary, GEC McMichael, and also reduced the number of staff at its South Wales plant by 29. The redundancies, according to Brian Moore, are designed to streamline the company.

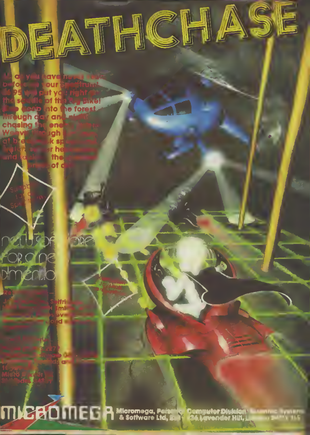
Dragon has had its fair share of set-backs in recent months. In September cash flow problems forced its shareholders to put up £2.5m to bale it out. At the same time Brian Moore was appointed by the shareholders to replace Tony Clarke. Then, in November, one of its shareholders, the troubled Mettoy toy manufacturer, went into liquidation. Its holding has now been shared between the company's remaining

continued on page 5

Dragon managing director Brian Moore

This Week

● **Reviews** *Barbara Conway looks at a selection of BBC adventures on page 16* ● **Spectrum** *Trevor Toms continues his series on machine code, see page 21* ● **Dragon** *C McGinley looks at the keyboard reading routine on page 24* ● **New Releases** *included in this week's selection are* Micro Drivin *from Softel and* Forty Niner *from Software Farm, page 52*


DEATHCHASE
MICROMEGA



16-22 February 1984 Vol 3 No 7

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Advertising Production
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Administration
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Managing Editor
Duncan Scot
Publishing Director
Jenny Ireland

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Editorial

Satellites are very much in vogue at the moment. First, the US space shuttle *Challenger* succeeded in losing two satellites within days of each other, then Sir Clive Sinclair anounced he could produce a satellite tv adaptor for just £100.

Now, nobody is suggesting that these two items are linked in any way but they do demonstrate that satellites are 'hot' at the moment.

However, while most people are thinking about satellites in terms of tv or radio communications, they also hold possibilities for computers. Project Universe which was set up three years ago with funds from the Department of Trade and Industry is looking at ways of linking together various local area networks via satellites. This would make it much easier for sophisticated computer systems to communicate with each other at high speed.

But, Project Universe is running out of money. It needs somewhere in the region of another £10m to develop a commercial system.

Since the project is an amalgamation of industrial, academic and governmental interests theoretically there should be no problems in raising additional finance. However, research budgets are extremely tight at the moment, so the money may not be forthcoming.

But then building a universe never was cheap.

Next Thursday

Can you land your commandos on the fort in Hot Drop — next week's star game for the BBC by Ken Swallow.

Software ban

continued from page 1

The technique developed by Jim Lamont uses an imprint signal recorded together with the data signal on the tape. The imprint is added at the master stage of recording, so no specialised duplicating equipment is required.

The imprint remains invisible to the computer, unless any copy of the tape is made — either by breaking into the program or by a direct tape-to-tape transfer. Any attempt to copy the tape corrupts the program.

The crucial aspect of the technique as far as the Ministry of Defence is concerned is that it is equally effective for protecting on line data. Conceivably the method could be used to prevent listening-in to either computer network links or other methods of data transfer, even via telephone lines.

Until the MoD action, JLC had been receiving around 70 calls a day from interested software houses. The company will receive some compensation for the loss of its patent. Said Jim: "Whether that compensation will be adequate I doubt very much."

He now plans to go ahead and try to interest software companies in an earlier version of his protection system out covered by the MoD's secrecy order. "The end result of the earlier method is about the same as the one we patented, but it is not so devious," he said. Trials of the less sophisticated system will begin this week when one software house begins a field test of the method.

Dragon fire

continued from page 1

ing investors.

And, most recently, Dragon's link up with Tanno in the US has produced disappointing results. Tanno failed to reach its sales target of only 5,000 machines last year and Dragon's US sales director George Merchant has been sacked.

Future Dragon computer products are now expected to be directed towards the business computer market. Intense competition and price cutting in the home computer market forced Dragon to cut the cost of its Dragon 32 shortly before Christmas by £25 to £145.

QL delays expected as orders grow

FIRST deliveries of Sinclair's new QL computer are now unlikely to be dispatched to customers until at least the beginning of March.

The 28-day period allowed for delivery in the company's mail-order advertisements will be up for the first would-be owners this Friday, February 17. Yet most of the first batch of machines expected at the end of this month will be sent to software authors for program development and to magazines for review.

The delay is apparently due to continuing development of the ULA chip and work still being carried out on the QL's SuperBasic. The design of the QL Microdrives has however now been finalised — none were in evidence in the machines shown at the January launch — and work to make the four Psion software packages fully compatible with the drives should be finished at the end of this week.

Orders for the QL are now building up at an alarming rate and some sort of order backlog — traditional for any new Sinclair product — seems inevitable.

Around 6,000 QL orders (worth £2.4m) have so far been placed and 3,000 of those have been taken in the last week.

Hype is the name of the game

HYPE is the name given to the first boardgame to be launched by a computer software house — Virgin Games.

While other companies are abandoning traditional boardgames in favour of their video equivalents, Virgin plans *Hype* as the first of a whole range of packages.

Based on the internal workings of the music business, the object of the game is to assemble your ideal rock band and 'hype' it into the Number 1 slot. The game — conceived by an existing group, *The Technos* — will be launched at the end of this month and will sell for £17.95.

Other titles to follow throughout 1984 will include *Robin Hood*, *Space Colony* and *Isomer* priced under £10 and a budget range including *Block-it*, *Bluff-it* and *Catch-It*.

Daisy wheel printer

PRICES for daisy wheel printers continue to fall. Star Computer Peripherals are launching a range of Silver-Reed printers with the basic model retailing for £344.

All the printers in the range support subscript, superscript and bold type — print speed on the basic model — the EXP 500 — is 12 characters per second.

More details from Star Computer Peripherals, Unit 6, Imperial Way, Worton Grange Industrial Estate, Reading, Berks.

Brother EP-44 printer

THE distinction between computers and typewriters blurs still further with the launch by Brother of its EP-44 personal printer.

The device is battery driven with full-size keyboard and 28x18 dot-matrix printer.

With 4K of Ram built-in, up to three A4 pages of text can be viewed on a 15-character liquid crystal display and edited before printing.

An RS232 interface allows it to communicate with other devices or to be used as a printer peripheral for a home computer.

The Brother EP-44 costs £253.

Micronet tapes

MRM Software is the first company to move from supplying programs on Micronet 800 — the database network — to producing them on cassette.

MRM's games *Q Man*, *Banana Man*, *Q Man's Brother*, *3D Munchy* and *Secret Sam* are all in Micronet's monthly BBC Top Ten.

Satellite tv receiver

SINCLAIR has given UK television companies a strong incentive to go ahead with their direct broadcast satellite tv plans.

The micro manufacturer has told the BBC and the IBA that it plans to design and produce a satellite tv receiver for under £100.

The cost of such receivers has proved a major stumbling block in the development of satellite tv. Sinclair's price for the device is around a fifth of previous estimates.

The £100 tag would include both the receiving dish and the decoding equipment needed to make the signal intelligible to any ordinary domestic tv set.

Such a low-cost package could well influence the decision of the joint working party presently deciding the future of satellite broadcasting in favour of direct broadcast television. Last year the BBC shelved its ambitious satellite broadcasting programme, following the failure of the European broadcasting companies to agree transmission standards.



ANDROID TWO
IT'S HERE.
ANDROID TWO
IN 3D.

Waiting for . . .

I would like to ask everyone who is waiting for ZX Microdrives the following question

There is a company called Sinclair,
Who brought out the Microdrive in despair
A year and a half late,
Was it worth the wait?
Rumours were spread
I was beginning to dread
So when the Postman knocked on my door
In his hand a Microdrive I saw
I quickly signed the paper
And had it set up five minutes later
In it the Demo cartridge, I did place
You should have seen the look on my face
It started to burr,
The LED started to glow
Surely it can't be this slow?
I waited a while
Away went my smile
I tried to press BREAK,
Was this a mistake?
It appeared to work
The drive stopped with a jerk
The screen was just white,
I nearly died of fright
My Spectrum had crashed,
The cartridge was slashed
My fists were clenched
From the power supply the plug was wrenched
I sat back and cried
Oh Sinclair well they tried
For my pen I did race
Does anyone make a disc interface?

Gavin Monk
Commonwealth Hall
Cartwright Gardens
London WC1H 9EB

PS May I also take this opportunity to recommend Andrew Pennell's excellent book *Master Your ZX Microdrive* to all Microdrive users

Aracade freaks

I was delighted and relieved to read Steven Mason's letter (*PCW* Letters 19-25 January)

This page, in particular, was beginning to create the impression that this magazine was being published solely for the benefit of arcade freaks Most of the Open Forum programs seem to be of the arcade variety and one becomes extremely despondent to keep on reading high scores for this, that and the next thing, week in and week out

At 40 years old I am not particularly into Zap-Pow-Shoot'em Down games and would much prefer to see some advice and programming for more intelligent uses of my Vic 20 I am especially interested in the creation and using of filing systems (I know this is tediously slow with cassette, but I cannot yet afford to uprate to a disc system)

Please don't spoil what is otherwise a very good magazine by allowing it to degenerate into a games-only publication

Peter Swift
22 Skippingdale Road
Scunthorpe
South Humberside DN 15 8NU

Golden sundial

Dear Pimaniac — until the back page of *Popular Computing Weekly* informs the world that somebody has won my golden sundial it is still in the possession of my wicked bosses at Automata

Keep reading the back page 'cause nobody's won it yet

Yours Piously
The Piman

Ideal language

I was horrified to read Iain Stewart's letter (*PCW* 2-8 February) on the subject of "ideal languages" The fact that he mentions a "huge array of structures" on the BBC shows that he has little idea of what structures actually are To my knowledge, the only structures the BBC has are *Repeat/Until* and *For/Next*, which are not really adequate Admittedly, the BBC has procedures and functions but they are rather limited in their power since it is possible to pass parameters by value only, and procedures cannot be local

To say that the "ideal language" should be capable of indirect jumps (*Goto* variable) is naive, indirect jumps make programs totally unreadable and difficult to debug, especially if they refer to line numbers, which they undoubtedly do in Basic hybrids In any case, what is *Goto* doing in an ideal language? Structures such as *Repeat/Until*, *While/Do* and *Case* structures remove the need for complicated jumping Obviously Iain Stewart has never heard of Pascal or Forth, both of which have a large number of structures

Forth comes very close indeed to my "ideal language" because of powerful words which allow you to create your own structure But it is worth bearing in mind that there is no "ideal language" For example, Logo with its advanced list processing capabilities and friendly operating environment, is ideal for teaching the rudiments of programming and maths, but is totally unsuited for writing operating systems If one language had all the desirable qualities of other languages, it would be too difficult to use My suggestion to Iain Stewart is to buy a book on Pascal or Forth

Do any other readers have views on structured programming or languages?

A Hegedus
20 Ebrington Road
Harrow
Middlesex HA3 0LR

"He's fixing the dish on the roof for satellite television "

Spectrum potential

The heading BBC & Education in the *PCW* index seems to suggest that it is only the BBC micro which has any serious educational uses

I own a Spectrum and use it principally for learning about the intricacies of computer programming, although I must admit to playing the odd game of the adventure type now and then However, education is also an interest of mine having two small children. More and more software houses in conjunction with book publishers are now producing excellent education packages for the Spectrum Additionally, with a ratio of 1m to 200,000 over the BBC micro, the Spectrum's potential is immense and it is one of the leading computers in schools up and down the country

While the Spectrum is an efficient 'games' machine, it is also a serious programmer's and educational machine This, coupled with the networking possibilities with the QL, will make the Spectrum of interest to small business users

In short, it is not just a games machine and I am sure many of your readers will feel the same So, how about giving credit where credit is due Spectrum — business, education and games

Larry Walker
16 Woodfield Close
Redhill
Surrey RH1 2DL

PS What has David Hesketh's game on horse racing got to do with education?

Manic Miner pages

I wonder if you can help me one of your regular readers

About two months ago a reader's letter appeared in one of your issues giving a list of entries which could be typed into the Spectrum to gain access to all the pages of the excellent *Manic Miner* program Sadly, I have now lost this particular copy and miss it greatly

Could you possibly send me this list or if necessary, a copy of the relevant issue of *PCW* which would be dated approximately late October or early November

David Crafts
Popeswood
Limes Lane
Buxted
Uckfield
East Sussex

No sooner said than done. For other readers who may be interested, the issue concerned is *PCW* 3-9 November.

AGF

PROGRAMMABLE JOYSTICK INTERFACE for Spectrum or ZX81

ONLY 26.95 +£1.00 pp

MICRODRIVE COMPATIBLE

AGF PROGRAMMABLE INTERFACE

Recognised as the only true Hardware Programmed joystick interface this product offers all the features associated with such a design.

You can use *any* Atari-compatible joystick controller with *any* software for your Sinclair Spectrum or ZX81, not just those with a joystick option.

Movement of the joystick is recognised by the computer *exactly* the same as pressing the appropriate control keys, and can therefore give the most immediate response to that movement. The hardware programmed design works with *all* possible key-reading methods, both BASIC and Machine Code.

Eight directional movement, with or without the fire button being pressed, can be achieved by only programming the left, right, up, down and fire keys required by the game.

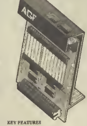
Programming is achieved by a two-digit code, which is looked up on the Programming Chart supplied, for each direction and firing button. These two numbers are then selected on a pair of leads which are clipped onto appropriately numbered strips on the interface.

Once configured this can be marked onto a Quick Reference Programming Card for storing with the game. As the programming is *not* power dependent the interface can be immediately used when next switched on.

The keyboard remains fully functional and can be used simultaneously with the joystick.

An integral rear expansion connector means there is no need to remove the interface to connect other peripherals.

NB A recent design improvement now means that the AGF Programmable Interface works with the new Quickshot II rapid "Auto Fire" feature.

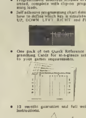


KEY FEATURES

- Programmable design gives TOTAL software support
- Accepts Atari, Competition Pro, Wico, Starfighter, Quick Shot, Le Stick etc.
- Rear extension connector for all other add ons.
- Free demo program and instructions.

PACKAGE CONTENTS SUPPLIED

- Programmable Interface Module as illustrated, complete with clip-on programming leads.
- Self adhesive programming chart detailing how to define which key is simulated by UP, DOWN, LEFT, RIGHT and FIRE.
- One pack of ten Quick Reference Programming Cards for at-a-glance setting to your games requirements.



- 12 months guarantee and full written instructions.

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NEW IMPROVED GRIP : BUILT IN STABILIZING SUCTION CUPS

TRIGGER FIRE BUTTON : RAPID AUTO FIRE SWITCH : TOP FIRE BUTTON

FROM MR/MRS/MISS

ADDRESS

SEND C.W.O. (NO STAMP NEEDED) TO A.G.F. HARDWARE, DEPT PW

FREEPOST, BOGNOR REGIS, WEST SUSSEX, PO22 9BR

QTY	ITEM	ITEM PRICE	TOTAL
	PROGRAMMABLE INTERFACE	27.95	
	JOYSTICK(S)	17.95	
	PACK(S) QUICK REFERENCE CARDS	1.00	
	ZX81 ☐ ZX SPECTRUM ☐ Please tick *DEALER ENQUIRIES WELCOME* *EXPORT PRICES ON APPLICATION*	FINAL TOTAL	


VALHALLA

Z-Fred

A new game for 16/48K Spectrum by Nicky King

This is a version of the arcade game Q-Bert for the 16/48K Spectrum. Full instructions are included in the program.

The program was written on a 48K machine — in order to convert the program for a 16K Spectrum, the machine code sound effects have to be removed. This is done by deleting lines 125-131 102, 68, and deleting the *Usr* calls in lines 33, 42, 89.

Line 106 contains the data for the empty pyramid graphics, these are *Poked* and subsequently printed on the screen. Line 122 holds the same data as the empty pyramid, but with the tops filled in, so that *Z-Fred* can fill in a blank top quickly (since UDG's already displayed can be redefined without altering the screen display).

The program consists of 10 main subroutines, all of which are clearly labelled with Rem statements.



```
1 BORDER 0: PAPER 0: INK 7: CLS
2 DATA [illegible]
3 RESTORE 2: FOR f=USR "a" TO USR "[illegible]"+7: READ a: POKE f,a: NEXT f
4 GO SUB 94
5 LET hi=0
6 REM [redacted]
7 LET [illegible]: LET [illegible]
8 LET [illegible]
9 REM [redacted]
10 LET [illegible]
11 LET [illegible]: LET [illegible]
12 GO SUB 104
13 LET box=0
14 LET level=1
15 LET a=4: LET b=10
16 LET [illegible]: LET count=0
17 LET [illegible]: LET [illegible]
18 LET level1=0
19 PRINT AT 2,0;"HI-SCORE ";hi
20 PRINT AT 3,0;"PYRAMID ";sheet
21 PRINT AT 2,0;"LIVES ";li
22 PRINT AT 1,0;"SCORE ";sc
23 REM [redacted]
24 IF sheet=13 THEN PRINT AT 3,0;"PYRAMID 1": LET sheet=1: LET li=li+1: PRINT AT 2,0;"LIVES ";li: PRINT AT 3,10; FLASH 1;"BONUS": FOR f=-20 TO 20: BEEP .01,f: BEEP .01,10-f: NEXT f: FOR f=1 TO 100: NEXT f: LET sc=sc+1000: PRINT AT 3,10; FLASH 0;"     "
25 LET chance=sheet-5
26 GO SUB 31
27 IF sheet<0 OR sheet>0 THEN GO SUB 44
28 IF sheet>4 THEN GO SUB [illegible]
29 PRINT AT 1,0;"SCORE ";sc
30 GO TO 23
31 REM [redacted]
32 PRINT AT x,y; INK 3;"[illegible]"
33 IF POINT (a,n)=0 THEN [illegible]: LET sc=sc+10: LET z=USR 65030: LET box=box+1: GO SUB 67: IF box=[illegible] THEN GO TO 42
34 LET x1=x: LET y1=y
35 IF INKEY$="[illegible]" AND y=10 [illegible] level1=0 OR INKEY$="[illegible]" AND [illegible] level=0 OR INKEY$="[illegible]" AND level=0 THEN GO TO 87
36 IF INKEY$="[illegible]" THEN LET [illegible]: LET y=y+2: LET level=level+1: LET a=a+16: LET n=n+16
37 IF INKEY$="[illegible]" THEN LET [illegible]: LET y=y-2: LET level=level-1: LET a=a-16: LET n=n+16
38 IF INKEY$="[illegible]" THEN LET [illegible]: LET y=y-2: LET level=level-1: LET a=a-16: LET n=n-16
39 IF INKEY$="[illegible]" THEN LET [illegible]: LET y=y+2: LET level=level+1: LET a=a+16: LET n=n-16
40 PRINT AT x,y; INK 3; PAPER [illegible];"AB"
41 IF x1<>x AND y1<>y THEN PRINT AT x1,y1; INK 7; PAPER [illegible]
42 IF box=21 THEN LET z=USR [illegible]: LET sc=sc+100: LET sheet=sheet+1: GO TO 9
43 RETURN
44 REM [redacted]
45 IF [illegible] THEN [illegible]
46 LET a=INT (RND*[illegible])
47 PRINT AT a,b; INK 2; PAPER [illegible];"CD"
48 IF x=a AND y=b THEN GO TO [illegible]
49 LET a1=a: LET b1=b
50 LET a=a+2: LET b=b+(2 [illegible])-(2 AND a=1)
51 PRINT AT a,b; INK 2; PAPER [illegible];"CD";AT a1,b1; PAPER [illegible];"  "
52 IF a=x AND b=y THEN GO TO [illegible]
53 IF a=18 THEN LET wait=[illegible]: LET count=(30 AND sheet=1)+(10 AND sheet=2)+(10 AND sheet=3)+(30 AND sheet=4)+(10 AND sheet=6)+(10 AND sheet=7)+(30 AND sheet=8)+(30*sheet=9)+[illegible] sheet=10)+(10 AND sheet=11 AND sheet=12)
54 IF wait=1 THEN LET count=count-1
55 IF count=0 AND wait=1 THEN LET wait=0: PRINT AT a,b; PAPER [illegible];"  ": LET a=4: LET b=10
56 RETURN
57 REM [redacted]
58 IF y=5/[illegible] AND x<x [illegible] THEN GO TO 63
59 IF y=18+(5-level)*2 [illegible] THEN GO TO 65
60 IF x=a THEN PRINT AT x,[illegible];"[illegible]";AT x,y-1;"[illegible]"; PAPER 7;"[illegible]"; PAPER 0;"[illegible]";AT x+1,[illegible];"KL"
61 PRINT AT x-1,y;"MI";AT x-1,[illegible]; PAPER 7;"[illegible]"; PAPER [illegible];AT x+1,y;"KL"
62 RETURN
63 PRINT AT x-1,y;"OI";AT x-1,[illegible]; PAPER 7;"[illegible]"; PAPER [illegible];AT x+1,y;"KL"
64 RETURN
65 PRINT AT x-1,y;"MP";AT x-1,[illegible]; PAPER 7;"[illegible]"; PAPER [illegible];AT x+1,y;"KL"
66 RETURN
67 REM [redacted]
68 LET z=USR 65000
69 PAUSE 10: LET li=li-1
70 IF a=x AND b=y THEN PRINT AT 10,7;"THE BALL GOT YOU": FOR f=1 TO 200: NEXT f: GO TO 73
71 IF e=x AND f=y AND [illegible] THEN PRINT AT 10,7;"THE SNAKE GOT YOU": FOR f=1 TO 200: NEXT f: GO TO 73
72 IF y=18+(5-level)*2 OR y=8+level*2 OR level=0 THEN PRINT AT 10,10;"YOU FELL OFF": FOR f=1 TO 200: NEXT f
73 IF li=0 THEN GO TO 75
74 GO TO 9
75 CLS
76 IF sc>hi THEN LET hi=sc: PRINT AT 4,0; FLASH 1;"NEW HIGH SCORE"
77 PRINT AT 10,2;"PRESS ANY KEY TO PLAY AGAIN"
78 PRINT AT 0,0;"YOU SCORED ";sc
79 PAUSE 0: GO TO 5
80 REM [redacted]
81 IF sheet<5 THEN LET chance=sheet-5
82 PRINT AT e,f; INK 9; PAPER [illegible];"EF"
83 IF (RND*7)>chance+1 THEN RETURN
84 LET e1=e: LET f1=f
85 IF e>x AND f<y THEN LET e=e-2: LET f=f+2
86 IF e>x AND f>y THEN LET e=e-2: LET f=f-2
87 IF e<x AND f>y THEN LET e=e+2: LET f=f-2
88 IF e<x AND f<y THEN LET e=e+2: LET f=f+2
89 IF e<>e1 AND f<>f1 THEN LET z=USR 65050
90 PRINT AT e,f; INK 9; PAPER 3;"EF"
91 PRINT AT e1,f1; PAPER 0;"  "
92 IF e=x AND f=y THEN GO TO [illegible]
93 RETURN
94 REM [redacted]
95 PRINT TAB [illegible];"[illegible] Z-PRED"
96 PRINT "[illegible] Z-PRED [illegible]; INK 2;"AB"; INK 7;" [illegible] all of the cubes without falling off of the pyramid and before the ball ("; INK 2;"CD"; INK 7;") gets him."
97 PRINT "Also you must watch out for the deadly snake ("; INK [illegible];"EF"; INK 7;") which will chase you all over the pyramid."
98 PRINT "You gain points by filling in all of the tops of the squares in the pyramid."
99 PRINT "If you complete pyramid 12 then you will be awarded a big bonus."
100 PRINT "The controls are   E   I
                                   \ /
                                    X
                                   / \
                                  J   P"
101 PRINT TAB 6; FLASH 1;"PRESS A KEY TO PLAY Z-PRED"
102 GO SUB 120
103 PAUSE 0: RETURN
104 REM [redacted]
105 CLS
106 DATA [illegible]
107 RESTORE 106: FOR f=USR "[illegible]" TO USR "[illegible]"+7: READ a: POKE f,a: NEXT f
108 PRINT TAB 15;"OP"
109 PRINT TAB 14;"M  N"
110 PRINT TAB 13;"OIKLMP"
111 PRINT TAB 12;"M  JB  N"
112 PRINT TAB 11;"OIKLMIKLMP"
113 PRINT TAB 10;"M  JB  JB  N"
114 PRINT TAB 9;"OIKLMIKLMIKLMP"
115 PRINT TAB 8;"M  JB  JB  JB  N"
116 PRINT TAB 7;"OIKLMIKLMIKLMIKLMP"
117 PRINT TAB 6;"M  JB  JB  JB  JB  N"
118 PRINT TAB 5;"OIKLMIKLMIKLMIKLMIKLMP"
119 PRINT TAB 4;"M  JB  JB  JB  JB  JB  N"
120 PRINT TAB 4;"IKLMIKLMIKLMIKLMIKLMIKLM"
121 PRINT TAB 5;"QR  QR  QR  QR  QR  QR"
122 DATA [illegible]
123 RESTORE 122: FOR f=USR "[illegible]" TO USR "[illegible]"+7: READ a: POKE f,a: NEXT f
124 RETURN
125 DATA [illegible]
126 DATA [illegible]
127 DATA [illegible]
128 DATA [illegible]
129 DATA [illegible]
130 RESTORE 125: FOR f=65000 TO 65[illegible]: READ a: POKE f,a: NEXT f
131 RETURN
```



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All the world's a stage

David Kelly talks to Graham Daubney and his accomplice, Topo

Robots are suddenly all the rage. You can't move these days without continually being introduced to some new wheeled wonder.

Although those in the know claim that personal robots will become the greatest thing since home computers, such a notion seems, on the face of it, puzzling. Most of the present generation of robots can do little more than a radio-controlled car costing a tenth of the price. They can both drive forwards and backwards.

But that is to miss the point. These new home robots have the potential, within the very near future, to do a whole lot more. And prices, which may seem excessive now, should soon begin to fall quite sharply.

One of the front-runners in this new technology is Androbot, a US company set up in 1982 to design and produce a range of personal robots. Androbot was one of a number of companies funded by Atari's founder Nolan Bushnell after he sold Atari to Warner Communications.

Androbot exhibited its first robot — Topo — at the January 1983 CES show. It was controlled by an Apple computer via a 27MHz radio link, using software written in Basic. Several hundred of these Topo 1s were sold before they were superseded by Topo 2 — the version we will see in the UK. Topo 2 uses an infra-red link instead of radio, software is written in Forth — which is better suited for robotics than Basic — and the units feature a built-in speech synthesiser.

In the UK, Prism has been appointed to handle the Androbot machines. The first development versions of Topo 2 were received by the company last November and work began under the direction of Graham Daubney — Prism's development manager — to convert the operating software to run with British computers.

"The first thing I did was to start work on a high-level robotics language for the BBC micro, working as an extension of BBC Basic," says Graham.

"BBC Basic has the rather useful feature that you can add extra command words to it, altering the look-up table and the syntax checker as you go. So far, we have finished the communications software enabling the BBC computer and Topo to understand each other, but we are still having to call some machine-code routines from Basic. The whole lot should be finished in a few weeks.

"The communications protocol of the infra-red transmission system has been the major development work for us on Topo."

The computer is connected via an RS232 interface to the infra-red tower — the base communicator. The tower contains an 8031 chip which packets up the information to send to the robot. Topo contains two 8031s to receive and send data, so both the base communicator and the robot are intelligent.

Using one infra-red tower and computer up to 16 Topos can be independently controlled. Four 'public' channels are also included, allowing the same instruction to be broadcast to every Topo within range at the same time.

Line of sight

The 'range' is about 200 feet. In a normal room there would be enough reflection of the infra-red signals from the walls and ceiling that the robot would not have to remain in line-of-site of the base tower.

Information sent to the robot is of two types — either motion data or speech data. Most of the space inside Topo's casing is taken up by a cage for accepting printed circuit-board cards. Two processor boards are supplied as standard, with room for another four or five. One handles the communication with the home base, the other interprets the movement instructions. A speech synthesiser board is built into Topo's head, together with a number of Rom chips containing the robot's firmware — its on-board software.

Androbot developed Topo's software to work with the Apple II computer. Prism is working on the BBC micro version, to be followed by software for the Commodore 64. "We are trying to write transportable code and many of the Forth routines have been translated pretty much as is from the Apple." Commands are self-explanatory: 90 Forward moves Topo forward by 90cm, 90 Left turns Topo through 90°.

At the moment, Topo is capable of little else apart from driving about and talking. But the age of the robot is only just beginning and there are many problems yet to be solved.

"How do you make a robot climb upstairs? Lateral thinking — for the moment the solution is move into a flat! But we are working on it. We have a joke at the moment: Why did the robot cross the road? Because it didn't know it was there.

"Vision is one of the biggest problems. Without recourse to very sophisticated software it is not possible for a robot to distinguish between different objects. Writing such a program is fine for development work but would be out of the question for an average computer enthusiast.

"So there may have to be some compromises with object identification — we may need to give the robot a helping hand by putting the object on a special plate." This plate might be a passive aid displaying a bar-code which could be read by the robot. Long-range bar-code readers are now available so the robot could pick up the information from some way off. Alternatively, the plate could be an active aid — an infra-red transmitter, for example.

Another idea is to use ultrasonic techniques. An ultrasonic detector works like radar — measuring distance by the time taken for an ultrasonic beam to be reflected back from some obstacle to the robot. In this way the presence of an object may be detected together with its size. "The problems start when you ask it to distinguish between two objects," says Graham. "If one is like a match box and the other the size of a TV then it should be okay but sorting out similar sized objects is much more tricky."

If the robot is preprogrammed with the dimensions of all the possible objects it may encounter, then it can make comparisons. But what happens if one object is square on to the robot while another is at an angle? The computer attached to the robot ends up having to take the co-ordinates of the object it sees and carry out a three-dimensional rotation of the corner points, trying to match them up with something it knows. Object identification is not as easy as it would first appear.

Having identified the object, the next thing might be for the robot to pick it up. "To begin with an arm of some sort seems a good idea. Unfortunately, they cannot lift much weight and are very complex to manufacture. At the moment we are thinking more in terms of a device which operates like a fork lift truck."

Both Androbot and Prism are working on a range of add-on units for Topo, giving it perhaps bump detectors, a bar-code reader, a lift, an ultrasonic detector, an arm, a vacuum cleaner, a lawnmower and maybe even a personality. The possibilities are endless and most of the really useful additions are still a long way off.

At £1,500 Topo isn't cheap. Personal robotics is only just beginning and there is an awful lot of work still to be done.

PEDRO

"Vengo" "Vengo" "Vengo"





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A snowball's chance

***Barbara Conway** finds herself walking some pretty mean streets in this round-up of BBC adventures*

After spending the new year industriously falling into pits and chasms drowning several times, being attacked by all manner of nasties ranging from trolls to giant insects and sinking my pacifist principles more times than I can count in order to wreak havoc of my own I just hope you appreciate the effort I have been putting in on your behalf

To be fair there have been compensations, such as the extraordinary array of treasures I have collected from rare gems to bunches of vegetables There have also been a pleasing number of new acquaintances, several of whom have so far refrained from trying to kill me together with at least one who will take any given opportunity (some of them decidedly inconvenient) to sit down and sing In fact taking everything, including the reincarnations, into account, it has really been quite fun

And that, of course, has been the object of the exercise Adventure games, if properly written, should leave the would-be hero(ine) at best triumphant and at worst frustrated but determined to try again and outwit the program Of the half-dozen I was trying out on the BBC "B", the general standard was excellent although one or two suffered from that bane of all adventurers the pointless maze, and their wearisome annoying, language problems

Despite offers of help when I got stuck by several of the software houses involved all these adventures were tackled on the basis that the buyer can't normally get help like that so neither would I After a good many years in daily journalism, I backed myself to have as devious a mind as any program writer In at least one case, I overrated myself dismally

The case in question was that of *Snowball*, from Level 9 Computing, My assignment was to rescue the giant colony starship *Snowball* from imminent destruction in the heart of a nearby star There were 200,000 sleeping colonists who had entrusted me with their lives, happily oblivious to the fact that they didn't have a "snowball's" chance with me as the only agent awake and able to deal with the emergency My most consistent score was 100 out of a possible 1,000

Shades of a lensman

The cassette is accompanied by a very detailed booklet putting the problem into its own historical perspective The adventurer is Kim Kimberley (do I detect faint echoes of the E E Doc Smith's "Lensman" books?) awaking prematurely in his/her freezer coffin to find that the directional programming has gone awry Urgent action is needed

So far, so good Few seasoned adventurers will have any difficulty escaping from the coffin but no points are gained from this so don't feel too smug about it The problems haven't even begun yet Using the very sophisticated language structure of the program, you now have to work your way up through the ship, from the lowest level, making sure that you pick up, and where necessary construct, items which will aid your mission There are no easy get outs in *Snowball* Yelling "help" gets you nowhere and invective doesn't help much either

There are said to be 7,000 rooms in all, although there is a great deal of duplication



on the various levels Nothing that you find is useless although some items are rather difficult to locate and hang onto and you can get useful experience in matters such as assembling a spacesuit As a general rule press buttons and pull levers whenever the opportunity presents itself And bird-lovers should take note that on *Snowball* hanging around to hear a nightingale sing will always have fatal consequences!

A complex original adventure with a hellish puzzle at the start and consistent brain exercise throughout

Onto one of the most frequently-reviewed, and innovative, micro adventure games going, Melbourne House's *The Hobbit*. This has finally emerged on the BBC and although the saga itself remains unchanged, there is one major difference from the Spectrum and other versions Because of the memory limitation of the BBC this version lacks the excellent graphics on the other machine

I can live with this lack quite happily, not least because, as a long-time fan of the original J R R Tolkein book (supplied with the game), I prefer to imagine the settings for myself And nothing has been lost from the adventure itself which follows the plot of the book very closely You are Bilbo the Hobbit reluctant adventurer, setting out to beard the dragon Smaug in his lair and steal his treasure But before you get anywhere near Smaug, you must travel across Middle Earth with (unless and until you lose them) Thorin the dwarf and Gandalf the magician as companions This is a real time adventure and, if you don't use the Inglish (sic) vocabulary to act yourself the other characters will carry on without you Given half a chance, Thorin will burst into song about gold while Gandalf will wander in and out and, if requested, may possibly give you a strange map which you can get another to translate for you, and maybe give you lunch as well

But life isn't all food and song Apart from a plentiful array of lethal nasties (beware the pale bulbous eyes) you are pretty well bound to find yourself thrown into jail at least once and, unless you have established friendly relations with one traveller



you won't get out You can give complex instructions, speak to the various characters, ask them to chat to each other and where essential, have a go at killing things But remember that Hobbits are very definitely not in the warrior class and use your wits and the book, wherever possible Don't get bloodthirsty and try to kill your friends either They will almost certainly turn the tables and even if you succeed you will live to regret it Or not.

The "interactive" element of *The Hobbit* does have clear limitations Although the characters act without you, those actions are mostly confined to popping in and out, singing and maybe grabbing something, like the map But this is carping *The Hobbit* is a pleasure to play and even after successfully completing the treasure-hunt there are still challenges It is possible to get scores of well over 100 percent through adroit adventuring I suppose it's only wistful yearning on my part that makes me wonder if anyone could ever produce a similar effort on Tolkein's mind-blowing *Hobbit* sequel *The Lord of the Rings*

Although *The Hobbit* has the most detailed and readable documentation of any game to date Salamander's case file for *Franklin's Tomb*, part of a wild detective trilogy, proves a very handy crib to keep around while wandering through the eponymous crypt So useful, in fact, that I can even forgive the use of one of the oldest gags in the business in the intro.

Mean streets

You are Dan Diamond ex-cop, private eye very much in the Marlowe mould Lured to a cemetery by a note delivered by a uniformed dame, the ground suddenly opens under your feet and there you are, in a strange chamber with a locked door behind you, no way back to the outside world and a distinct feeling that these streets are the meanest yet

Franklin's Tomb comes into the 'moderately difficult" class of adventure, but it has a pleasant sense of humour which lifts it above the norm It is possible to get killed (beware of getting into any one way systems without suitable precautions) and there is a desperately frustrating "maze' problem involving some over-playful giant bats The spelling also looks a bit eccentric at times but, in at least one case what I thought was a spelling mistake turned out to be an important clue A very appealing package

Castle Frankenstein from Epic Software is a more familiar scenario After an opening cacophony (incidentally *Franklin's Tomb* has a *Pink Panther* musical intro while *Snowball* has a complex musical theme of its own) you find yourself in a village neighbouring the castle of the title There have been mysterious murders locally and the villagers have nominated lucky old you to find out if the dreaded Monster has returned

This is rather more of a conventional adventure than the others in this group and there were some language problems (if I am told I am on an east/west road I get annoyed if told I can't go west) But after a bit of trial and error it is possible to get around fairly well providing that you have managed to gather a few essentials of which the lamp may well be the most important

Not my favourite, but a substantial adventure with fast reaction times and a good screen lay-out

Last but not least two of Acornsoft's own adventures starting with *Sphinx Adventure* Like the rest, these are text-only Starting from the top of a mountain, the adventurer must find the Sphinx and live to tell the tale (and collect the treasure) amassing points, and penalties, en route

Acornsoft adventures tend to have a sense of the ridiculous, despite accepting limited vocabularies Those used to indiscriminately killing beings which seem to stand in their way may not get very far Magic can come in handy as can a certain limited knowledge of zoology and as always when in doubt pick up objects and when you have too many make sure you can find what you drop The use of most things becomes reasonably apparent quite quickly and there are plenty of objects scattered around

In *Countdown to Doom* the start is similar to that of *Snowball* since you are apparently trapped in a spaceship control room But when (if) you get out of that one the scene changes completely You are on the grim treasure planet of Doom and, if you know what's good for you you'll get as much loot as you can fix the ship and blast off before you're stranded there for eternity

There are plenty of ways to die on Doom, and most of them can if approached in the right spirit be forestalled and turned to your advantage Remember that Doom is hostile but pretty logical Staying for too long in the freezing cold can kill you just as effectively as the dreaded pit But there are ways out of most problems particularly if you find ways of manipulating the fourth dimension and you can get on with the computer (players only familiar with cassette drives for micros may have a problem in that last respect)

Both these games are absorbing and require intelligent consideration as well as humanitarian instincts (reckless killing can damage your prospects considerably) Being killed yourself may be little more than an inconvenience since reincarnation can be swift and, although it involves unpredictable changes of location does not deprive you of your hard-won treasures My own feeling was that *Countdown* was marginally the more devious, and therefore enjoyable of the two but neither should disappoint

Firm	Program	Cost
Acornsoft c/o Vector Marketing Denington Estate Wellingborough Northants NN8 2RL	*Sphinx Adventure* *Countdown to Doom*	£9 95 £9.95
Melbourne House 131 Trafalgar Road Greenwich London SE10	*The Hobbit*	£14 95
Salamander Software 17 Norfolk Road Brighton East Sussex BN1 3AA	*Franklin's Tomb*	£9 95
Level 9 Computing 229 Hughenden Road High Wycombe Bucks HP13 5PG	*Snowball*	£9 90
Epic Software 10 Gladstone Street Kibworth Beauchamp Leicester LE8 0HL	*Castle Frankenstein*	£7 95

Bilingual bytes

***Ian Logan** explains some of the mysteries of Basicode*

On the 14th of January 1984 the BBC's Radio 4 acknowledged the existence of the 'microcomputer revolution' by launching its weekly *Chip Shop* (Radio 4 at 5pm on Saturdays, and 11pm on Tuesdays)

And as a part of the programme there is a takeaway service of free programs. These programs are broadcast in *Basicode*, and should be loadable into a wide range of common microcomputers. So far, the free programs have been games, but it is intended that in the broadcasts to come, there will be a wide range of programs — hopefully including ones sent in by listeners

However, in order to take advantage of the 'free' *Basicode* programs, it is necessary to get a *Basicode*-kit costing £3.95 from the BBC — as yet, there is no such kit available for the Spectrum. A full *Basicode*-kit program will allow for both the *Loading* of a *Basicode* program and for its conversion into the dialect of Basic that is used in the Spectrum. This conversion will not be easy and, until the proper *Basicode*-kit program for the Spectrum appears, it is a matter of guess work as to just how limited the conversion might be

In this first article, I would like to discuss the 'tape standard' used in the transmission of the *Basicode* programs, and in next week's article give a program for the Spectrum that allows *Basicode* programs to be *Listed*. But in order to get a *Basicode* to Run, it will be necessary to re-enter the program into the Spectrum — making the required changes as appropriate (probably not very easy)!

The *Basicode* programs are transmitted serially using a 2-tone system. Logic 1's are represented by two full waveforms at 2400 hz, and logic 0's by a single full waveform at 1200 hz. Each byte of data is sent 'least significant bit' (lsb) first, and only the lower seven bits of a byte are sent — as this is all that is necessary to convey the normal Ascii character set.

Normally, before the bytes of the program are sent, there is a seven second 'leader' made up of single full waveforms at 2400 hz. Before each byte of the program there are three full waveforms at 2400 hz that form a byte-leader, and a byte start-bit of a single waveform at 1200 hz

The tape will normally be read by first 'locking onto' the 'leader' of the program and then, for each byte, identifying byte-start-bit before collecting the seven bits that together form a byte of data

The use of byte-leaders and byte-start-bits allows for a computer to re-synchronise itself to each new byte of data, thereby allowing for differing 'clock rates' between machines. The first byte of a *Basicode* program is normally a byte of value 2 and the last byte one of value 3. As there is no header to the program itself, the end of a program can only be identified by the finding of the '3' byte

The *Tape Examining* program that accompanies this article allows a 48K Spectrum to be used as an oscilloscope. With this program it is possible to produce 127 traces, spanning a half of a second's reading of the Spectrum's cassette port.

The program uses the machine code routine

```
start   ld a,07h        ;clear port
        out (0feh),a
        ld hl,8020h     ;clear memory
        ld (hl),00h
        inc hl
        ld d,h
        ld e,l
        ld bc,71dfh
        ldir
        ld b,40h        ;mask bit 6
        ld hl,8020h     ;start of memory
loop    in a,(0feh)
        and b           ;mask cassette bit
        ld (hl),a       ;store result
        inc hl          ;step on
        ld a,h
        or l
        jr nz,loop      ;until at 0000h
        ret             ;all done
```

The 'loop' examines the cassette port every 1/73000 of a second and therefore gives a fairly good demonstration of the 1200 hz and 2400 hz signals found in a *Basicode* transmission

The results obtained with this program are shown in Figures 1-3

In next week's article I will give a *Basicode* listing program, but in the meanwhile why not try to write your own. All the necessary information is contained in the above article and *The Complete Spectrum Rom Disassembly* by myself and Dr Frank O'Hara.

Figure 1
This shows a section of the 7 second leader. There are repeated full waveforms at 2400 hz — each half wave takes about 700 t states

TAPE EXAMINER by Dr.Ian Logan
0 2 4 6 8 10 12
Thousands of t states (approx)
0 1 2 3
Milliseconds (approx)
Trace number 44 (of 127)

Figure 2
This shows part of a byte of data. The bits of this byte are all logic 0's and each full wave takes a little over 300 t states.

TAPE EXAMINER by Dr.Ian Logan
0 2 4 5 6 10 12
Thousands of t states (approx)
0 1 2 3
Milliseconds (approx)
Trace number 1 (of 127)

Figure 3
This shows a typical byte-leader followed by a byte-start bit. The byte-leader goes from the 500 t state point to the 5000 t state point, and the start bit from 2400 to 8000. The first two bits of the byte of data are both logic 0's in this tracing

TAPE EXAMINER by Dr.Ian Logan
0 2 4 6 8 10 10
Thousands of t states (approx)
0 1 2 3
Milliseconds (approx)
Trace number 117 (of 127)

```
  1 REM **  TAPE EXAMINER  **
  2 REM ** by Dr.Ian Logan **
 10 CLEAR 32767
 20 REM ** get machine code **
 30 FOR a=0 TO 31: READ b: POKE 32768+a,b: NEXT a
 40 PRINT AT 4,0; PAPER 6;"TAPE EXAMINER  by  Dr.Ian Logan "
 50 REM ** read tape **
 60 PRINT AT 13,0; PAPER 6;"  Start tape and press any key   "
 70 PAUSE 0
 80 RANDOMIZE USR 32768
 90 REM ** display routine **
100 PRINT AT 13,0; PAPER 5;" Stop tape now.  Press any key   "
110 PAUSE 0
120 PRINT AT 13,0; PAPER 6;"0    2    4    6    8    10   12"
130 PRINT PAPER 6;"Thousands of t states  (approx) "
140 PRINT AT 16,0; PAPER 6;"0        1         2         3    "
150 PRINT PAPER 6;"Milliseconds  (approx)          "
160 LET t=1
170 PRINT AT 21,0; PAPER 6;"Trace number ";t;" (of 127)";TAB 31;" "
180 LET p=0
190 LET a=32544+t*256
200 LET n=PEEK a: LET n1=PEEK (a+1)
210 IF n THEN PLOT p,100
220 IF NOT n THEN PLOT p,80
230 IF n<>n1 THEN PLOT p,80: DRAW 0,20
240 LET p=p+1
250 IF p<256 THEN LET a=a+1: GO TO 200
260 INPUT "Next trace number (0=RUN)? ";t
270 IF t<1 THEN RUN
280 REM ** clear trace **
290 IF t>127 THEN GO TO 260
300 REM ** clear trace **
310 PRINT AT 9,0;: PRINT TAB 31;:CHR$ 32'TAB 31;CHR$ 32;TAB 31;CHR$ 32
320 LET p=0
330 GO TO 170
500 REM ** machine code data **
510 DATA 62,7,211,254
520 DATA 33,32,128,54,0,35,84
530 DATA 93,1,223,127,237,176
540 DATA 6,64,33,32,128
550 DATA 219,254,160
560 DATA 119,35,124,181
570 DATA 32,247,201
```



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Boosting the beep

***Trevor Toms** looks at the beeper in his series on machine code*

One of the weakest features of the Spectrum is the beeper, which manages only barely audible squeaks of limited form in Basic (ever tried to listen to the sound effects from that new game at a ZX Microfair?). Machine code certainly widens the type of effects that can be created, although this still falls behind the more recent home computers. Gripes aside though, this week we'll look at ways of using a couple of Rom entries that allow you access to the beeper.

Firstly, let's look at the way of simulating the *Beep* command. The Rom routine is *XBeep*, at address 3B5h, and it requires that the FP stack holds the pitch as the topmost item with the duration as the second. If you're unsure about the FP stack (not the Z80 stack), read last week's article. Since I have not had sufficient space to describe the format of floating point numbers, it is not possible for me to describe the best way of placing numbers on the FP stack, but with only simple arithmetic, it is quite easy to obtain almost any value that you need.

Personally, I find that it is easiest to assume that all beep durations occur in multiples of 1/100th of a second and that all pitches take integer values only. You are not restricted to this, but it does make life simpler. Listing 1 shows you a small program that simulates

```
10 FOR b=0 TO 69
20 BEEP 0.05,b
30 NEXT b
```

Remember that the longest duration is 10 seconds, and the highest pitch value is 69. Go outside these ranges and you'll be given a suitable error report from the *XBeep* routine.

If you want to play a complete tune, then the best method is to hold your tune data in a series of *DEFW* instructions terminated by a duration of −1. Listing 2 shows such a subroutine — all you need to do is add your tune at the appropriate point. The example plays a short melody.

Moving onto effects you need a routine called *XSound* at Rom address 3B5h. In this routine registers DE hold the effective duration, while registers HL hold the relative pitch. The values in these registers can be worked out to provide genuine tones, but I would suggest that you might as well use the *XBeep* routine if that's what you want to do. *XSound* is much more useful for creating effect and Listing 3 shows how you might approach the creation of a sound effect. Don't ask me what it's supposed to sound like — just see how it has been achieved!

With the *XSound* routine, you must be aware of one or two side effects. Firstly, the Spectrum interrupts are disabled during the routine, so lengthy noises will cost your fast action game dearly. Secondly the duration of the routine (supplied in registers DE) alters with different frequencies such that doubling the frequency will have the duration for the same given value supplied in DE. By all accounts the best way is to experiment with different values set within loops such as that shown in Listing 3. Keep the values of DE low so that sounds are produced rapidly, making it possible to create a type of "white noise".

Since this week's article is slightly shorter, I will spend a little time refreshing the concept of assemblers for the newcomers to the series. An assembler is a way of entering your machine code in mnemonic form, such as that shown in the examples. All jumps, calls and data references can be made using symbol names, letting the assembler assign a value to the symbol while running. In this way the programmer can free himself/herself from the necessity of calculating the number of bytes needed in relative jump instructions — the assembler does it automatically.

Coding becomes more structured, since it is not necessary to leave those awkward gaps needed for patching up a non-working program. In addition the likelihood of errors due to decimal/hex translation reduces to nil! There are many assemblers available nearly all of which are quite capable of dealing with the listings and routines given in these articles with only a few minor alterations.

By Trevor Toms, author of The Spectrum Pocket Book, published by Phipps Associates

```
                    LISTING 1 - Simulating BEEP command

Addr Hex        Op   Operands

 ...            BEEP'
D6...           EQU  ...
D6D8            STKEC:
D6D8            ORG  ...BH
D6D8            BEGIN$HERE:
D6D8 010000     LD   BC,0        ;STARTING PITCH
D6DB            LOOP:
D6DB C5         PUSH BC          ;SAVE PITCH
D6DC 0105 0     LD   BC,5        ;...
D6DF CD2B2D     CALL STKBC       ;...
D6E2 016400     LD   BC,100
D6E5 CD2B2D     CALL STKBC
D6E8 C1         POP  BC          ;...
D6E9 C5         PUSH BC          ;...
D6EA CD2B2D     CALL STKBC       ;...
D6ED EF         RST  28H         ;...
D6EE ..         DEFB 0C0H        ;SAVE PITCH
D6EF ..         DEFB 02H         ;...
D6F0 05         DEFB 05H         ;...
D6F1 E0         DEFB 0E0H        ;GET PITCH
D6F2 ..         DEFB ..H         ;...
D6F3 CDF503     CALL XBEEP       ;...
D6F6 C1         POP  BC          ;PITCH ...
D6F7 ..         INC  BC          ;INCREMENT ...
D6F8 214500     LD   HL,69       ;END LIMIT
D6FB AF         XOR  A           ;CLEAR ...
D6FC ED42       SBC  HL,BC       ;CHECK ...
D6FE 30DB       JR   NC,LOOP     ;KEEP ...
D700 C9         RET              ;BACK TO ...

Symbols:
XBEEP   03F8      STKBC  2D2B
BEGIN$  D6D8      LOOP   D6DB

No error(s)
```

continued on page 23



Listing 3

```
D6D8
D6DB
... ROUTINE
... REGS. ...
... D6E1    NOISE ...
```

Keyboard table

C McGinley shows how to make use of the Dragon's keyboard reading routines

Locations 337-345 are known as the keyboard rollover table. With no keys pressed, they each hold the value 255. Whenever a key is pressed the appropriate location changes to a certain value (Fig 1 shows a few examples).

The values produced when a key is pressed stay the same all the time the key remains pressed. Reading the keyboard by *Peeking* the appropriate location, instead of using *Inkey$* from within a program can produce a repeat key effect. An example from Fig 1 — forgetting location 337 for now — Cap A = location 339 and value 251 when pressed. This method allows more than one key to be read at a time by *Peeking* the appropriate locations. These locations and values can be found by using Program 1 and pressing the key required.

Other than *Peeking*, the only way a key can be read again is after the rollover table has been reset. This is achieved on releasing the key, therefore there is no repeat key. Writing 255 to these locations from within a program will also produce a sort of repeat key usable with *Inkey$*. A subroutine jump will produce this, eg

```
50 A$ = INKEY$ IF A$ = "" THEN 50 ELSE GOSUB
1000 FOR A = 337 TO 345 = POKE A, 255 NEXT
RETURN
```

Machine coding is a better method to do this and also opens up ways of making repeat key a function of the machine. The following method makes use of the systems interrupts.

Every 1/50th of a second the processor stops what it is doing and runs various interrupt routines, ie to refresh Ram, update clock, service any peripherals that require it, etc. When a regular interrupt (IRQ) happens, the processor jumps to and runs the routine at the location held in the reset vector table (&H BFF0 — &H BFFF). The IRQ location (&HBFF8) holds &H10C which in turn holds a three byte routine

&H10C	7E	JMP
&H10D	9D	9D
&H10E	3D	3D

This instruction sends the processor to routines starting at &H9D3D.

If we alter the address held in &H10D and &H10E we can divert the interrupt to a routine of our own design before sending it on its normal path. If this is a rollover reset routine, then every interrupt the rollover table will be reset ready for re-reading. A basic machine code loader at the beginning of a program will achieve this. Assembly Listing 1 and Program 2 are examples.

To develop this further, it would be nice to have a repeat key available all the time. This can be achieved with the interrupt method, but just resetting the rollover table is not adequate — an element of delay is required but with certain conditions, ie

(i) There must not be a delay every interrupt, otherwise operation of the computer will be slowed down to unacceptable levels

(ii) Delay is only required on the first character to allow time to release the key if only one character is required

(iii) Subsequent characters need no delay

Assembly Listing 2 is a machine code routine that produces the above conditions. I have produced a delay by using address 32766 as a counter. Counting up to 50 produces a useful delay.

Working through the routine — the first stage is to clear the address used as a counter and then load IRQ jump address with the location of my routine. The main routine first checks location 337 of the rollover table. This address always changes whichever key is pressed. If it is 255 (no key pressed) it then checks the counter to see if it is 50. If true (delay complete) it resets rollover table and exits to interrupt. If the counter is less than 50 it increments counter and exits to interrupt.

The machine code from Assembly Listing 2 can be loaded with Program 2 by altering the data in line 10 to the data in column 2 of Assembly Listing 2 (do not forget the FINI at the end). Then delete lines 100–130 in Program 2.

Assembley Listing 1

```
7FBD CC7FC4      20      LDD #BRK,PCR  LOADS INT. VECTOR
7FC0 FD010D      30      STD $10D      WITH ADDRESS OF
7FC3 39          40      RTS           MY ROUTINE
7FC4 CCFFFF      50 BRK  LDD #$FFFF
7FC7 8E0151      60      LDX #337
7FCA ED81        70 @RESET STD ,X++    RESETS ROLLOVER
7FCC 8C0159      80      CMPX #345     TABLE
7FCF 26F9        90      BNE @RESET
7FD1 A784       100      STA ,X
7FD3 7E9D3D     110      JMP $9D3D     EXITS TO INT.
7FD6            120      END
```

Assembley Listing 2

```
7FBD 7F7FFE      20      CLR 32766      RESTS DELAY COUNTER
7FC0 CC7FC7      30      LDD #BRK,PCR   DIVERTS INT.
7FC3 FD010D      40      STD $10D       TO MY ROUTINE
7FC6 39          50      RTS
7FC7 B60151      60 BRK  LDA 337        CHECKS FOR KEY
7FCA 81FF        70      CMPA #255      PRESSED
7FCC 2606        80      BNE RSTART,PCR IF YES CARRY ON
7FCE 7F7FFE      90      CLR 32766      IF NO RESETS COUNTER
7FD1 7E9D3D     100      JMP $9D3D      AND EXITS TO INT.
7FD4 B67FFE     110 RSTART LDA 32766    CHECK DELAY COUNTER
7FD7 8132       120      CMPA #50
7FD9 2F12       130      BLE @FIRST,PCR UNDER 50 MISS RESET ROLLOVER
7FDB CCFFFF     140 @CLEAR LDD #$FFFF
7FDE 8E0151     150      LDX #337
7FE1 ED81       160 @RESET STD ,X++     IF 50 RESET
7FE3 8C0159     170      CMPX #345      ROLLOVER TABLE
7FE6 26F9       180      BNE @RESET,PCR AND EXIT TO INT.
7FE8 A784       190      STA ,X
7FEA 7E9D3D     200      JMP $9D3D
7FED 7C7FFE     210 @FIRST INC 32766    INCREMENT COUNTER
7FF0 7E9D3D     220      JMP $9D3D      AND EXIT TO INT.
7FF3            230      END
```

Programme 1

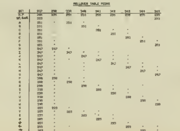
```
5 '****ROLLOVER TABLE*****
10 CLS:PRINT "locat on","n.p. pressed
":PRINT STRING$(32,"-");
20 FOR A= 337 TO 345:PRINTA,"255"
:NEXT A
:PRINT @396,"[    ]'
30 A$=INKEY$:IF A$= " THEN 30
40 IF ASC(A$)=10 THEN A$="DOWN]"
:GOTO 80
50 IF ASC(A$)=8 OR ASC(A$)=21
THEN A$="L
EFT]": GDTO 80
60 IF ASC(A$)=9 THEN A$="RIGHT]"
:GOTO 80
78 A$=" '+A$+" )"
88 B=08:PRINT @397,A$'     ;
.FOR A=337 TO
 345:PRINT @8,PEEK(A):8=8+32:NEXT A
90 GOTO 30
```

Programme 2

```
10 DATA CC,7F,C4,FD,01,0D,39,CC,FF,
FF,8E
,81,51,ED,01,8C,01,59,26,F9,A7,84,
7E,9D,
3D,FIN]
20 CLEAR 200,32700:A=32701
30 READ A$:IF A$="FINI" THEN 40
ELSE POK
E A,VAL("&H'+A$}:A=A+1:GOTO 30
40 EXEC 32701
50 DEL-50
100 '
110 '*****MAIN PROG*****
120 CLS:PRINT "PRESS ANY KEY"
130 A$=INKEY$:IF A$="" THEN 130
ELSE PRI
NT A$,:GOTO 130
```



Fig.1



ROLLOVER TABLE PEEKS

[illegible]	337	338	339	340	341	342	343	344	345
N.P	255	255	255	255	255	255	255	255	255
sp. bar	[illegible]								[illegible]
A	251	.	251	.					
B	251			251	.				
C	251				251	.	.		
D	251					251	.		
E	251						251	.	
F	251	.						251	.
G	251	.							251
H	247	247	.						
I	247	.	247	.	.	.			
J	247	.		247	.	.	.		
K	247	.	.		247	.	.		
L	247	.		.		247	.	.	
M	247	.		.			247	.	.
N	247	.		.				247	.
O	247	.							247
P	239	239	.	.					
Q	239	.	239	.					
R	239	.		239	.	.		.	
S	239	.			239	.	.		
T	239	.				239	.		
U	239	.					239	.	
V	239	.						239	.
W	239	.							239
X	223	223	.						
Y	223	.	223	.	.				
Z	223	.		223	.	.			
↑	223	.			223	.			
↓	223	.				223	.		
←	223	.	.				223	.	.
→	223	.						223	.

Character building

S Pithers demonstrates the use of the BBC's multi-coloured charactars

This program is an improvement of one found in the BBC user guide. Although it is a fairly entertaining program in itself, its real value is as a demonstration of the use of the BBC's multi-coloured characters.

Ordinarily you have to *Pling* each one directly. However, in this program I have instead used the *Gcol 3,x* instruction — the important lines to note are 50-80 and 260 onwards. It should be easy to take out the relevant sections for use in your own programs.

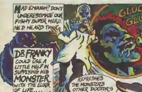
Program Notes

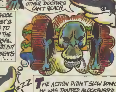
40	MODE 2
50—80	DEFINE CHARACTERS
90—110	DEFINE VARIABLES & JOIN TEXT & GRAPHICS CURSOR
120	REPEAT LOOP
130	READ A PIECE OF DATA
140	VARIABLE B$=CHR$ VALUE OF THE DATA
150	VARIABLE A$=A$+B$
160	UNTIL DATA=227
170	REPEAT LOOP
180—210	IF THENS FOR SCREEN WALLS
220	GOTO PROCEDURE P: INCREASE VARIABLES
230	UNTIL LOOP
260—290	PROCEDURE FOR PRINTING MULTI COLOURED CHARACTER ON SCREEN

```
10 REM New Tartan
20 REM  By S. C. Pithers.
30 REM
40 MODE 2
50 VDU 23,224,255,129,129,129,129,129,
129,255
60 VDU 23,225,0,126,66,66,66,66,126,0
70 VDU 23,226,0,0,60,36,36,60,0,0
80 VDU 23,227,0,0,0,24,24,0,0,0
90 T=8
100 X%=640:Y%=512
110 TX%=T:TY%=T:VDU5
120 REPEAT
130 READ B
140 B$=CHR$(B)
150 A$=A$+B$
160 UNTIL B=227
170 REPEAT
180 IF X%<20 THEN TX%=T
190 IF X%>1260 THEN TX%=-T
200 IF Y%<20 THEN TY%=T
210 IF Y%>1000 THEN TY%=-T
220 PROCP:X%=X%+TX%:Y%=Y%+TY%
230 UNTILFALSE
240 END
250
260 DEF PROCP
270 MOVE X%,Y%
280 PRINT A$
290 ENDPROC
300
310 DATA 18,3,1,224,8
320 DATA 18,3,2,225,8
330 DATA 18,3,3,226,8
340 DATA 18,3,4,227
350
360 REM Changing the 'T' variable
370 REM to 16,32,48 or 64 for example
380 REM will change the tartan like
390 REM pattern, also try different
400 REM Multicoloured characters to
410 REM change the effect.
>
```


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BEANZ MEANZ PHEW!!
HELP!
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Pass the mustard . . . please

T Ellenieder presents Hot Dog — a game for two players

In this program you are the owner of a hot dog chain in New York. The game is played by two players who have to decide on prices and the amount of bread and sausages to buy. The number of customers you get depends on the weather, advertising and the price of the hot dogs. Extra customers may be attracted by buying expensive meat instead of the cheaper meat.

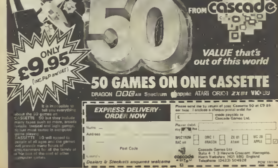
Program notes

1-100	Initialise variables
100-200	Prices
200-300	Main loop, screen output
300-500	Calculate customers
500-2000	Display, instructions

```
1 REM****************************************
  ******************************
2 REM*****************************HOT DOG****
  ******************************
  REM****************************************
  ******************************
4 PRINT"
5 POKE53280,0:POKE53281,0:PRINTCHR$(14):
  GOSUB 2000
6 M(1)=4000:M(2)=4000
10 PRINT"
20 PRINT"                    HOT DOG"
30 PRINT"     HOW MANY MONTHS DO YOU WANT
   TO PLAY?
40 INPUT"              (3-12)";A
50 IF A<3ORA>12THEN RUN
60 FOR N=1 TO 100:NEXT N
65 FOR M=1TOA
70 PRINT"
80 PRINT"     PLAYER 1                PLAYER2"
100 PRINT"  TAB(0)M(1);TAB(20)M(2)
105 REM**********************************
106 REM*******PRICES*********************
107 REM**********************************
110 PB=INT(100*RND(1))+200
120 PA=INT(1000*RND(1))+2000
130 P(1)=INT(100*RND(1))+100
140 P(2)=INT(100*RND(1))+200
150 P(3)=INT(100*RND(1))+300
160 W$(1)="GOOD":W$(2)="FAIR":W$(3)="BAD"
170 W=INT(3*RND(1))+1
180 WE$=W$(W)
200 REM**********************************
201 REM*******MAIN*LOOP******************
202 REM**********************************
210 FOR N=1 TO 2
220 PRINT"
230 PRINT"PLAYER:";N;TAB(13);"$";M(N);"
    WEATHER:";WE$
240 PRINT"     (1 BOX CONTAINS 50)
245 PRINT" 1.ST GRADE : ";P(3)/100;TAB(20)"
    P.BOX"
250 PRINT" 2.ND GRADE : ";P(2)/100;TAB(20)"
    P.BOX"
255 PRINT" 3.RD GRADE : ";P(1)/100;TAB(20)"
    P.BOX"
260 PRINT" ... OF ...:";PB/100;TAB(19)"
    (... CONTAINS 50)"
270 PRINT"               FOR 100
275 PRINT"
280 INPUT"ENTER BREAD ...";NB(N)
282 PRINT"
284 INPUT"ENTER ... ";NS(N)
286 PRINT"
288 INPUT"ENTER GRADE OF SAUSAGE ";GS(N)
290 PRINT"
292 INPUT"ENTER ADVERTISEMENTS";NA(N)
293 PRINT"
300 PRINT"
310 PRINT TAB(...)"...";TAB(20);NB(N)*PB/100
320 PRINT TAB(...)"...";TAB(20);
    NS(N)*P(GS)/100
325 IF NA*PA/100<99 THEN 340
330 PRINT TAB(...)"...";TAB(20);NA(N)
    *PA/100:GOTO350
340 PRINT TAB(7)"ADVERTS ";TAB(19);
    NA(N)*PA/100
350 PRINT TAB(18)"----------"
355 TT(N)=(NB(N)*PB+NS(N)*P(GS)+NA(N)*PA)/100
360 PRINT TAB(16)"$ ";TT(N)
370 IF M(N)-TT(N)<0THEN PRINT"WHAT IS ALRIGHT"
    :GOTO384
380 PRINT"...!!!!!"
381 PRINT"... AGAIN!!!(PRESS ANY KEY)":PRINT"
382 GET A$:IF A$=""THEN382
383 GOTO220
384 M(N)=M(N)-TT(N)
395 INPUT"ENTER PRICE PER HOT DOG";PR(N)
399 PRINT"
400 NEXT N
401 REM**********************************
402 REM*******CALCULATION****************
403 REM**********************************
410 FOR N=1 TO2
420 IF NS(N)*50<NB(N)*50 THENMS(N)=NS(N)*50
422 IF NB(N)*50<NS(N)*50 THENMS(N)=NB(N)*50
424 IF NS(N)*50=NB(N)*50 THENMS(N)=NS(N)*50
430 MV(N)=100*(4-GS(N))*NA(N)*(4-W)
440 DP(N)=200-PR(N)
442 IF DP(N)<0THENMV(N)=MV(N)/(DP(N)*10)
444 IF DP(N)>0THENMV(N)=MV(N)*DP(N)
450 ZP(N)=MV(N)*10/100
460 TV(N)=ABS(INT(ZP(N)*RND(1))+MV(N)-P(N))
465 IF TV(N)<=MS(N)THENVS(N)=TV(N)
467 IF TV(N)>MS(N)THENVS(N)=MS(N)
480 NEXT N
481 PRINTMS;"  ";MV"
490 REM MS=MAX.SERVED
491 REM (MV=MAX.VISITORS)
492 REM TV=TOTAL VISITORS
494 REM VS=VISITORS SERVED
496 REM TT=TOTALS SPENT PREVIOUSLY
498 REM PR=PRICE OF SAUSAGE
500 REM**********************************
501 REM*******FINAL DISPLAY**************
502 REM**********************************
505 PRINT"-----------------------------
    -----"
510 FOR N=1 TO 2
520 PRINT"PLAYER:";N
530 PRINT"YOU HAD ";TV(N);" VISITORS."
540 PRINT"YOU SERVED";VS(N);"VISITORS.
550 PRINT"YOUR PROFIT IS: ";VS(N)*PR
    (N)/100-TT(N)
560 PRINT"YOUR TOTAL IS: ";M(N)+VS(N)*PR(N)
```

```
    /100:M N)=M(N)+V: N)*PR(N)/100
570 PRINT"------------------
    -----"
580 NEXT N
585 IF M(1) =0 OR M(2) =0THEN1000
586 PRINT"PRESS ANY KEY!!!
587 GET Z$:IF Z$=""THEN 587
590 NEXT M
600 PRINT"□
610 PRINT"**************************************
620 PRINT"** YOU HAVE REACHED THE FINAL
    RESULTS**"
630 PRINT"**************************************
640 PRINT"PLAYER 1"
650 PRINT"TOTAL: ";M(1)
660 PRINT"---------------------------------
670 PRINT"PLAYER 2
680 PRINT"TOTAL: ";M(2)
690 PRINT"---------------------------------
700 IF M(1)>M(2)THEN PRINT" DECLARE PLAYER
      1 AS THE WINNER!!!!!!!
710 IF M(2)>M(1)THEN PRINT" DECLARE PLAYER
    2 AS THE WINNER!!!!!!!
720 IF M(2)=M(1) THEN PRINT" DECLARE A
    DRAW!!!!!!!"
800 INPUT A$
810 IF A$="Y"THEN NEW
820 RUN
900 END
1000 FOR N=1TO 10
1010 PRINT"**************************************
1020 NEXT N
1030 PRINT"*****SOMEONE WENT BANKRUPT
     *************
1040 FOR N=1 TO 10
1050 PRINT"**************************************
1060 NEXT N
1200 FOR I=1TO10000:GOTO600
2000 PRINT"□"
2002 PRINT"          INSTRUCTION!!
2004 PRINT" YOU ARE THE OWNER OF
     A  ...  CHAIN
2006 PRINT"              IN ...
2008 PRINT"  YOU HAVE TO DECIDE ON HOW TO

     RUN YOUR
2010 PRINT"                  BUSINESS.
2012 PRINT" DECISION ABOUT THE ...
     AND AMOUNT OF "
2014 PRINT"     ... YOU BUY HAVE TO BE TAKEN
2016 PRINT"     YOU HAVE A CHOICE OF ... GRADES
2018 PRINT"        ... GRADE BEING THE BEST!!
2020 PRINT"      A TOO HIGH PRICE WILL KEEP THE
     CUSTOMERS AWAY!!!"
2022 PRINT"              GOOD LUCK!!
2030 GET H$:IFH$="" THEN2030
2040 RETURN
READY.
```



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Open Forum

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the _Program of the Week_ double our new fee of £5 for each program published

Mastermind

on Vic 20

This game was written on the unexpanded machine but it should also work if you have the 3K Ram pack fitted. The instructions are exactly the same as for the popular board game. A white dot indicates a correct colour in the right place.

Using logic you should be able to get the right combination. There are six colours and any combination may be chosen, a skill level determines how many colours you have to guess. Load listing 1 before loading listing 2 and save listing 2 as "*MASTER*"

Program notes

1)

0	Lowers memory to protect graphics
10-15	Pokes data into memory
30	Is Play depressed?
40-50	Mastermind is Loading

2)

5	Clears memory of old program
10	Asks for difficulty 3-6
18	Checks input
20-80	Picks random sequence
100-136	Defines grid
140-146	Defines slots
150-180	Your guess
210-300	Right and wrong
310	Dots on screen
340	Loops back
400-410	Hidden code revealed
500-590	Goes taken/another go?

Listing 1

```
0 POKE56,28 POKE52,28
10 POKE36879,246 POKE36863,255 PRINT"" PRINT"DIFFICULTY 3 TO 6"
15 GETN$ IFN$=""THEN15
16 IFVAL(N$)<3ORVAL(N$)>6THEN15
17 N=VAL(N$)
20 FORX=1TON
30 A(X)=INT(RND(1)*6)+1
40 NEXTX
100 A$="+ " B$=" ," C$="& " D$="<," FORX=1TON-1
110 A$=A$+"/ " B$=B$+". " C$=C$+"& " D$=D$+".,"
120 NEXT A$=A$+"*" B$=B$+"-" C$=C$+"&" D$=D$+"'"
130 PRINT""A$ FORK=1TO? PRINT"" C$
135 PRINT"" B$ NEXT PRINT"" C$ PRINT"",D$
140 C$(1)="" C$(2)="" C$(3)="[" C$(4)="]" C$(5)="↑" C$(6)="←"
145 D$(6)="!$" D$(5)="!%" D$(4)="!" D$(3)="#" D$(2)="$" D$(1)=":"
146 E$(6)="!$" E$(5)="!%" E$(4)="!" E$(3)="#" E$(2)="$" E$(1)="."
150 S=20 X$(1)="" TB=9
155 S=S-2
156 X$="I N P U T G U E S S"
160 FORX=1TOLEN(X$) PRINTMID$(X$,X,1) NEXT
163 FORG=1TON
164 PRINT"" PRINTRIGHT$(X$(1),S) PRINTTAB(TB), PRINT" ", PRINT""
165 GETI$ IFI$=""THEN165
170 IFVAL(I$)<1ORVAL(I$)>6THEN165
180 B(G)=VAL(I$) TB=TB+2 PRINTC$(VAL(I$)) NEXT
190 X$="" " FORX=1TOLEN(X$) PRINTMID$(X$,X,1) NEXT
210 GOSUB1000 GOSUB2000
220 FORX=1TON FORY=1TON
230 IFX=YTHEN295
240 IFH(Y)=0THENGOTO295
250 IFB(X)=0THEN300
260 IFB(X)=H(Y)THENW=W+1 H(Y)=0 B(X)=0 GOTO295
295 NEXTY
300 NEXTX
301 IFB=NTHEN500
310 TB=4 PRINT"" PRINTRIGHT$(X$(1),S) PRINTTAB(TB),D$(B),E$(W)
320 TB=9 PRINT"" W=0 B=0
330 IFS<=0THEN400
340 GOTO155
400 PRINT"BAD LUCK"
410 PRINT"THE HIDEN CODE WAS"
420 PRINT"" FORX=1TON PRINTC$(A(X)), NEXT PRINT
440 GOTO550
500 PRINT"WELL DONE IT TOOK YOU",INT(20-S)/2," TURNS"
550 PRINT"ANOTHER GO Y OR N"
560 GETL$ IFL$=""THEN560
570 IFL$="Y"THENRUN
590 IFL$<>"N"THEN560
600 PRINT"" POKE36869,240 POKE36879,27 END
1000 FORX=1TON H(X)=A(X) NEXT RETURN
```

```
1806 FOR X=1TON
1810 IFE(X)=H(X)THENH(X)=0 B(X)=0 B=B+1
1820 NEXT RETURN
```

Listing 2

```
1 REM #### - POKE56 28 POKE52,28 PRINT"" CLR PRINT HM
2 PRINT "▮▮▮▮▮▮▮▮▮       ┌────────┐
3 PRINT         |PLEASE  WAIT |"
4 PRINT         └────────┘"
10 FOR =1TO,4#, READS POKE7167+.' , NEXT
15 FOR =0TO,N, READS POKE7448+7.S NEXT LP POKE36869 255
20 PRINT "]"
30 IF PEEK(37151)=126THENPRINT"▮▮▮▮▮▮▮▮▮PRESS PLAY" GOTO
40 PRINT"▮▮▮▮▮▮▮▮▮ ,,, , ,      ♦        #MASTER  MIND
50 PRINT      A I  LOADING&        ' '  ' ' , '  ,'
60 POKE56 28 POKE52,28 LOAD"#MASTER#"
70 DATA24 60 112 251 247 112,60,24,120,66 66 66 126 66
110 DATA120 65 66 65 126 65,65,126,14 16,32 64,64,64,64,126
120 DATA120 66,65,65,65,65 66,120,6 8,16,62 64,64 64,126
130 DATA66 9,16,62,64 64 64,64,14 16,32,64 64,70 66 126,66,66        126,66,66,66
140 DATA126 8,8,8,8 8,8,126 126,8,8,8,8,72,48,24
150 DATA64 64,66 66 72,80,120,70 64,64,64,64,64,64,64,126
160 DATA 120 76,74 73,73,73 73,73,120 76 66,65,65,65 65 65
170 DATA248 132 130 129 129,65,33,31 120,68,66,126,64,64 64,64
180 DATA246 132 130,129 137,69,35 31,120,62 66,126,96 80,72,68
190 DATA14 16 32,64,124,4 6,112,126,8 8,8,8,8 8 8
200 DATA66 66,66,66,34,18,10,6,66 66,66,66,66,38,24,24
210 DATA146,146,146,146,146,82,50,14,129,66,36 24,24,36,66,129,66,66,34 30 4,8 1
96
220 DATA126,2,4,8,16 32,64,126,24,36,118,231,247,102 60,24
241 DATA24,36,118,199,225,70,60,24,24 60,94,215 195,113,60,24
242 DATA24 36,110 227,251,98,60,24 24 52 110 227,235,98,60,24,0,0,0,0 0 0 0,0
243 DATA0,102 102,0 0,102,102 0
244 DATA0,102 102,0,0,96,96,0,0 102,102,0,0,0,0 0,0,96,96,0,0,0,0,0
245 DATA 8,8 8,8,8 8,3 6 6,8,6 15 8,8,8,8,8,8,6,15,0,0,0 0,8,8 8 248,0,0,0 0
246 DATA 0,0,0,248,0,8,8,8,0 0,0,15,8,8,8,8,0 0,0,255,0,0,0,0,8,8 6,248 8,8,6 8
247 DATA 8 8 8,255,0,0 0,0,0 0,0,255,8,8,8,8
280 DATA15,19 37 73,146,164,200,240,24,56,88,24,24,24,24,126
290 DATA240,8,4,2,127,64 64,127,120,4 2,1,63 1,1 127
300 DATA2,4,8 18,34,127,2,2,127,64,64 126,2,4,0,240
320 DATA15 16,32,64,124,66,65,127,127,1,2,4,8,16 32 64
340 DATA24,36,66,129,126,129,66,60,127,65,33,31,1,2,4,120
370 DATA255,255,255 255,255,255,255,255,0,0,0,0,0,24 24 0,6 6 5 255 , 8 8
```

Mastermind
by M Tooley

Screen Copy

on Spectrum

This program was designed for the 48K machine but it is relocatable for owners of 16K by moving it down memory. The routine allows the whole screen (192 lines) or parts of the screen to be copied onto the ZX printer. Play around with the input values to get an idea of the kinds of effects you can achieve

```
  1 REM ***********
  2 REM *LINE COPY*
  3 REM ***********
  4 REM
 10 CLERA 65199
 20 DATA 243,6,176,33,0,64,205,
176,14,201
 30 FOR n=65200 TO 65009. READ
 POKE n,a  NEXT n
 40 CLS . INPUT "Start line 0-1
92 ",s
 50 INPUT "Amount of lines to b
e printed ";c
 55 LET a=(16384+s*32)/256
 60 POKE 65002,c  POKE 65205,IN
T a  POKE 65204,a-INT a
 70 PRINT "To activate the rout
ine use      RANDOMIZE USR 65200"
 80 INPUT "save y/n ",n$
 90 IF n$="y" THEN PRINT "The c
ode to be saved on tape    when
activated will copy from    line
",s," for ",c," lines."  SAVE "l
copy"CODE 65200,10
```

The routine will run at any address

Screen Copy
by Daniel Bland

Shadow

on BBC

This is a routine which can be called when shadows are needed as a decorative feature on titles of programs names of authors of programs or even copyright notices

Use of the *Procedure* is explained in Rem statements in the listing and will run on a BBC model B

The foreground printing colour can be changed for personal preference by changing the *gcol* value in line 300

Program rules

240	Change true colour 0 (black) to logical colour 7 (white) and change true colour 7 (white) to logical colour 0 (black)
250	Change text cursor to graphics cursor
260	Work out to place p$ in central X position and put value in I
270—320	Print p$ and shadow
330—340	Wait three seconds
350	End of procedure

The printing is achieved by firstly printing the black shadow, and then printing the different colour slightly off position in the X and Y direction

```
10 REM  ******************
20 REM  *                *
30 REM  *     SHADOW     *
40 REM  *       BY       *
50 REM  *ABDUL.A NATHEKAR*
60 REM  *                *
70 REM  ******************
80
90 REM   P$ CONTAINS THE WORD TO BE
100 REM  PRINTED WITH ITS SHADOW
110 REM           AND
120 REM  B% IS THE GRAPHIC SCREEN
130 REM   , CO-ORDINATE WHERE THE
140 REM  WORD IS TO BE PRINTED.
150 REM  500 IS IDEAL FOR TITLES.
160 REM  MAXIMUM LENGTH OF CHARACTERS
170 REM  IN P$ IS 17.
180 REM  MODE HAS TO BE CHANGED TO
190 REM  MODE 2 BEFORE CALLING

200 REM   PROC$SHADOW.
210
220 DEFPROC$SHADOW(P$,B%)
230 CLS
240 VDU19,0,7,0,0,0,19,7,0,0,0,0
250 VDU5
260 I= 640-(32*LEN(P$))-10
270 MOVEI,B%
280 GCOL0,7
290 PRINTP$
300 GCOL0,5
310 MOVEI+9,B%-7
320 PRINTP$
330 T=TIME+300
340 REPEAT UNTIL TIME>T
350 ENDPROC
```

Shadow
by Abdul Nathekar

Sorting

on BBC

This sort program can be helpful in producing in alphabetical order lists of record discs video tapes etc

This puts to use the BBC micro B and a printer Names are entered as *Data* statements and the end of the listing Termination of the *Data* is executed by zzz. It is worth noting that lower case letters will be considered after capitals

```
10 REM VIDEO LIST
20 DIM name$(200)
30 count_in = 0
40 REPEAT
50 count_in = count_in + 1
60 READ name$(count_in)
70 UNTIL name$(count_in)="zzz"
80 REM to sort the VIDEOS ETC
90 scan = 2
100 FOR count_out = 1 TO count_in - 1
110 FOR sort = scan TO count_in - 1
120 IF name$(count_out) < name$(sort) THEN 160
130 temp_store$ = name$(sort)
140 name$(sort) = name$(count_out)
150 name$(count_out) = temp_store$
160 NEXT sort
170 scan = scan + 1
180 NEXT count_out
190 REM to print the list
200 VDU2
210 PRINTSPC(25)" VIDEO LIST"
220 PRINTSPC(25)"************"
230 PRINT'
240 FOR p_out = 1 TO count_in - 1
250 PRINT TAB(20);p_out TAB(25)name$(p_out)
260 NEXT p_out
270 VDU3
300  DATA THE LADY KILLERS
301  DATA A CASE FOR P.C. NINE
302  DATA WENT THE DAY WELL
303  DATA VAMPIRA
304  DATA DRY ROT
400   DATA zzz
```

Sorting
by A Moulden

Function Keys

on BBC

This program effectively gives the user 20 function keys using the 0 1 operating system instead of the usual 11 It does this by assigning Key O to call a short machine code routine located at &ODOO to switch between two sets of functions

Key in all the bytes from the hex dump as *Data* in the program Then go through the same routine for your second set of definitions To find how many bytes you are using when programming the keys use *Print* ?&OB11 Quite probably one set of functions will use more memory than the other, as in line 260 the number after the CPX statement must be the larger of the two numbers obtained plus one

Note that in both sets of definitions, Key O must be defined as *Call* &ODOO·M Below are the function key definitions

```
KEY 0  CALL&ODOO·M
KEY 1  RUN M
KEY 2  :NLIST M·O
KEY 3  CLS.M
KEY 4  NEW M
KEY 5  LOAD"" M
KEY 6  SAVE'
KEY 7  CALL&000:M
KEY 8  MODES6 M·NLIST M·O
KEY 9  MODE7 M
KEY 10 OLD M
```

```
KEY 0  CALL&ODOO.M
KEY 1  *LOAD "8000 M
KEY 2  LIST07 M
KEY 3  LIST00 M
KEY 4  AUTO
KEY 5  RENUMBER
KEY 6  *LOAD:M
KEY 7  LOAD"
KEY 8  *CAT.M
KEY 9  *MOTOR
KEY 10 OLD M
```

```
10 REM ***** FUNCTION KEYS ******
20 REM ***** ROBERT TURNER ******
30 REM ***** SEPTEMBER 1983 *****
40 DIM A$(91)
50 FOR A%=0 TO 91
60 READ A$(A%)
70 A%?&0B00=EVAL("&"+A$(A%))
80 NEXT A%
90 FOR A%=0 TO 91
100 READ A$(A%)
110 A%?&0D20=EVAL("&"+A$(A%))
120 NEXT A%
130 FOR PASS=0 TO 2 STEP 2
140 P%=&0D00
150 [OPT PASS
160 LDA #0
170 TAX
180 TAY
190 .loop LDA &0B00,X
200 TAY
210 LDA &0D20,X
220 STA &0B00,X
230 TYA
240 STA &0D20,X
250 INX
260 CPX #92
270 BNE loop
280 RTS
290 ]
300 NEXT
310 DATA 11,10,1F,26,2A,2E,35,3A,44,51,57,5B,
    5B,5B,5B,5B,5B,5B,43,41,4C,4C,26,30,44,30,
    30 0D,52,55,4E,0D
320 DATA 0E,4C,49,53,54,0D,0F,43,4C,53,0D,4E,
    45,57,0D,4C,4F,41,44,22,22,0D,53,41,56,45,
    22,43,41,4C,4C,26,36,30,30,30,0D,4D,4F,44
330 DATA 45,36,0D,0E,4C,49,53,54,0D,0F,4D,4F,
    44,45,37,0D,4F,4C,44,0D
340 DATA 11,10,27,2E,35,36,41,47,4C,51,57,5B,
    5B,5B,5B,5B,5B,5B,43,41,4C,4C,26,30,44,
    30,30,0D,2A,4C,4F,41,44,22,22,38,30,30,
    30,0D,4C,49,53,54,4F,37,0D,4C
350 DATA 49,53,54,4F,30,0D,41,55,54,4F,52,45,
    4E,55,4D,42,45,52,2A,4C,4F,41,44,0D,4C,
    4F,41,44,22,2A,43,41,54,0D,2A,4D,4F,54,
    4F,52,4F,4C,44,0D
```

Function Keys

by Robert Turner

Microradio

GW6JJN

Software library

It appears that Microradio is having some influence on the world at last Gillian Orpin, proprietor of the National Software Library, 200 Mulgrave Road Cheam, Surrey SM2 6JT, has written to me with some very good news for radio-computing enthusiasts

Gill, who reads this column regularly, has decided to add some amateur radio programs to the Library's catalogue The programs are for the Sinclair Spectrum and are published by G4INP Software The first program is *Awards Manager* (reviewed in *PCW* Microradio, 26 January-1 February).

The second program is *Contest Duping* What is *Contest Duping* you might ask? Well, when taking part in a contest on air, it is important to know whether a station has already been worked, because if it is entered twice, or duplicated in the log then points will be lost This program allows you to enter the callsign of a station and the computer will tell you whether to go ahead or not

A month or two ago, a gentleman in Scotland wrote to Microradio asking if it were possible to find a program for the Spectrum which would plot the positions of the planets in the solar system, including the sun and moon He was interested, as a radio amateur and astronomer, in the date and time, both real and sideral, of the various planets I remember writing back to him explaining that I knew of no such program

Good news — I have found one It is called *Ephemeris* by Bridge Software and is available from the National Software Library Also available from the library is *The Night Sky*, again from Bridge Software This remarkable program will draw a star map for any time and date for any given direction

I would like to congratulate Gillian Orpin on being the only software library in Britain to carry radio software

I realise, of course, that in the past there has been much discussion about software libraries and whether or not they affect sales of software I, like many other computer users, have bought software only to be disappointed

As far as radio-computing is concerned, we are dealing with utility programs which can often cost a lot more than games The advent of a software library, which includes such utility programs in its repertoire, means that a particular program can be hired and, if it is what you want, bought from the library at a substantial discount For once there are real advantages to the consumer — surely not a bad thing since without the consumer there would be no computer industry

Ray Berry GW6 JJN

[illegible] covered write to [illegible] Microradio, *Popular Computing Weekly*, 12-13 Little Newport [illegible]



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Tony Bridge's Adventure Corner



Hall of the mountain kings

This week I'll look at some more of your letters the first one is from Philip Maxey of Forest Hill in London

"I have just bought a ZX81 with 16K memory I cannot find any good adventures for it, and would be glad if you would suggest some Also I would be very pleased if you could give me some hints on writing some adventure programs

The good old ZX81 has been rather neglected of late but of course, it is still the little machine that introduced many thousands of us to the joys of computing There are however still many good adventures for the machine Artic's programs, available for the Spectrum were originally written for the ZX81 There are four (the latest one unfortunately, was written for the Spectrum only) and all are text only extremely addictive and a good introduction to adventuring

The original adventure program was written on a huge mainframe computer, but there are several versions around for the rather smaller ZX81 — one of which comes from Abersoft and is called *Adventure 1* (we are still waiting for *Adventure 2*) Carnell Software will supply you with a couple of extremely good programs *Volcanic Dungeon*, which remains one of my favourites (it is a sort of text punch up), and *Black Crystal*,

Phipps Associates have several good adventures for the ZX81 including the great *Knight's Quest* (anyone who has ploughed through more than a couple of the corners will know that this is one of my very favourites!) There should be enough there to keep anyone happy for several weeks!

"Dear Tony I have recently bought Level 9's *Colossal Cave* for our Lynx 48K After some hours of logic brainstorming and lateral thinking, we keep finding ourselves stuck in the hall of the mountain kings Help! It's driving us crazy — every time we offer the snake something or mention the word *Give* the program prompts 'To whom?" (What good grammar in an adventure? Well this is Level 9 of course!)

No matter how we word or arrange the question the response is always the same With the prospect of a further 270 locations to go, I am reluctant to send away for my free clue so soon, writes Alan Eastaugh of Birmingham

Keep that free clue 'til later, Alan, believe me you'll need it! For now try this
HJIUCBKTE*RO*PCEANG*EW

Once past that snake you'll find one of the most fascinating adventures around

Andrew Dilley writes to me from Godalming in Surrey "A few issues ago you had a letter asking you what *PSBL* and *DID* meant when they appeared during *Pirate's Cove* for the Vic

"When they appear they are followed by numbers These numbers correspond to the responses that the computer can give *PSBL* tells you the possible responses that can be given to a particular command while *DID* tells you the number of the response you got This can be very useful!

"For example if you break mirror and you get three different PSBL numbers you know that it is worth pursuing this line of thought! After all with three different responses available one of them must be good! Typing P >return< gets you the numbers, while "X" >return< gets you back to normal

"I have only tried this with *Pirate's Cove* and *Voodoo Castle* but it may well work with all of the Scott Adams adventures"

And Simon Mills of London SW12 writes in a similar vein "Re the hieroglyphics found in *Pirate's Cove* They are not a bug as you might have thought They are probably a way for Scott Adams to check that the adventure is doing what he intends The feature can be obtained by pressing *X P* or *T* — they are available on all adventures by him There is another single-letter command that can be used and that is *V* This speeds up the rate at which the text is scrolled

'Another command that I have found is AUT — I haven't yet found what it does but assume it stands for Auto I have solved four of the Scott Adams adventures for the Vic20 and I am at present stuck on *Mission Impossible* Could you please tell me how to open the blue door? I have opened all the others!"

Finally a couple of letters that I can't answer — if you know, let us all know!

I cannot get any further than the grill in the stone slab in *Arrow of Death pt II* (from Channel 8 Software) Please can you tell me how to open it? Also, is there another exit from the beginning (for example, over the narrow gorge?) If so how do I do it?' asks I Senator of West Moors Dorset

I have recently purchased a Commodore 64 with disc drive and among the games that came with the package is *The Quest* Having spent the best part of 60 hours with the problem of getting out of the first set of rooms I have finally decided to put pen to paper!

'I have got the sword out of the ground but cannot get any further I've investigated as thoroughly as possible While I still have some hair left I'd really like a pointer on how to escape from this dilemma " pleads Keith Irving of Morayshire, Scotland

I hope someone can help with these problems Next week HHOF!

Are you stuck in an adventure? Are you faced by a problem that seems insurmountable? *Adventure Helpline* may be the answer

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BOOTSTRAP ROM

Alison Davis of Wall Walk Carlisle Cumbria, writes

Q Please can you tell me what a bootstrap *Rom* is? I have a Spectrum, and I do not think it has one, does this matter?

A Some computers, usually the larger business models, have only a very small *Rom*, called a Bootstrap *Rom*. This type of *Rom* has within it only a very few routines. Such computers have a *Dos* or Disc Operating System. In effect this means that *Rom* is stored on Disc, not on board the computer. The Bootstrap *Rom*'s only job is to get the Disc with the Operating system, loaded into a reserved area of *Ram*.

Although this may seem a clumsy system, in fact it is far more flexible. Loading or 'Booting Up' the Disc only takes a few seconds, and it means that a whole variety of languages can be used depending on the individual user's specific requirements.

ISSUE NUMBER

A Donnahue of Leighton Buzzard writes

Q I have a 16K Spectrum which I bought a few months ago, and I thought it was an issue 3 model. I have looked at a friend's and mine together, and have checked the expansion hole at the back, and they seem the same. Can you please tell me how to tell the two issues apart, just so I can be sure of what I have got, because I will want to up-grade at some time.

A Any Issue 2 Spectrum will have its issue number somewhere on the PCB. However if you do not want to take the top off then there are ways of telling the issues apart from looking at the expansion port. Issue 1 models can also be identified by a small hole in about the middle left of the base of the computer. At the bottom of this hole is a small brass screw which, in fact, is a trimming capacitor, which means that it is easier to tune in an issue 1 Spectrum if this is necessary. If you look through the expansion port you will also see several brown discs, these are ceramic capacitors and are not visible on issues 2 & 3.

The most obvious give away otherwise is the heatsink. On the issue 2 this is hardly visible as it runs down the left hand side of the computer. Turn the computer upside down and look through the expansion port at the underside of the top moulding and that is exactly what you will see — a shiny black surface. On the issue 3 however, if you do this you will see a not quite so shiny aluminium surface. The heat sink of the issue 3 runs along the back of the computer, and above the expansion port. There are other ways of telling, especially if you undo the computer, but these are the easiest.

USR FUNCTION

Henry Thompson of Ashtree Close, Middlesbrough, writes

Q I have a Dragon 32 with which I am learning BASIC quite well. At school friends with other computers have used the *Usr* function, and I know that it is meant to be available on my Dragon, but I cannot get it to work. I always get the same thing happening whether I use *Usr 0* or *Usr 8* or whatever.

A There is a bug in the *Rom* routine that takes you to the address specified in the Usr statement. There is in fact a simple solution, add a nought in front of the number, thus *Usr 8* would become *Usr 08* and so on.

COMPUTER MARKET

John Davies of Muswell Avenue Muswell Hill, London N10, writes

Q Please could you advise me if there are any major developments taking place in the computer market at the moment? I have got a ZX Spectrum, which I have had for a year now, but I am wondering whether to expand my system or get a new computer — possibly a Sinclair QL.

I've heard rumours that all the present systems, costing under £1000 will soon be out of date. If so could you advise on a system that will not be obsolete a few months after I buy it?

A There are always major developments taking place. Manufacturers and the press play a game, where the manufacturer must let enough information about a potential new product to leak out so that the public's interest and attention are maintained without giving too much away to their competitors. It is a situation made more complex by the fact that some manufacturers encourage independent software houses, where others do not.

The QL did take most people by surprise, because it was announced so quickly. It remains to be seen whether or not deliveries and reliability can keep pace. The track record does not offer a lot of hope, but you never know. The most important point to keep in mind is, does the computer I have now do what I want it to do? Remember when a computer has sold as many units as the Spectrum has, it just does not die. I still get letters every week from ZX81 and Vic20 owners. Both are computers that are meant to be dead.

It is a fact that already computer technology far outstrips the average user, so why buy the latest all singing, all dancing model if you are not going to get anything extra out of it? The best analogy is with calculators: there are some exceptionally sophisticated models now available. Personally I have an old simple one. I do not use it for anything complex so I have no intention of getting rid of it for a better model. This highlights the approximate differences between this country and America, where people are more likely to dispose of their existing machine for something new. Look at the problem the TS1000 had, once the 2000 was announced.

As regards price, I think it is just the case that a computer which would have cost £1500 a year or two ago will be below the thousand pound mark in a year or so's time. In this respect the new Sinclair QL is the marker against which all other cheaper computers will have to compare themselves — taking this role from the BBC. But whatever you buy it will always be superseded at some time — why wait?

THE SAME ANSWER

David Freeman of Great Eastern Street Cambridge writes

Q I have a question that I have seen answered for other computers but not my own. I hope the answer is not going to be the same. My question is this. How do I make my programs break proof; the computer I have is the Oric.

A I am afraid that the answer is going to be similar in that there are no completely fool proof ways of stopping someone breaking into your programs. There is a book by Bob Maunder called *The Oric Handbook* which contains several useful tips and hints, but in the end it is the same story: any program that can be written can be broken.

BBC PROBLEM

J Musket of All Hallows Road Caversham Road, Reading, writes

Q I have a BBC micro model B. On listing a program with a first line of 300 or more, then later at the end typing *Old* (R) then *List* (E) the first line number changes. Line 300 changes to 44, and all the numbers above three hundred change. For example 650 become 138, line 1000 is 232, 2000 as 16, and 3000 as 48. A dummy line such as 100 *Rem Cold isn't it*, gets over this problem. But why should this be? What do you advise?

A To be honest I do not have an answer to your question. You do not say what operating system you have. I can only assume that in fact it is one of the bugs in the 0 1 OS, as there were a couple relating to the use of the *Old* command. Anyone else with a 0 1 have the same problem?

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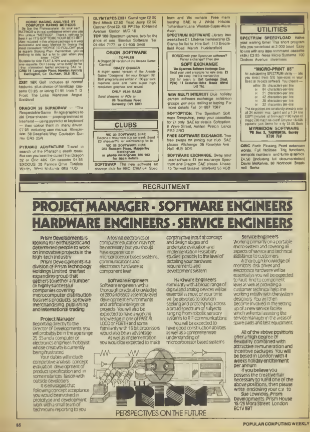
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LWS

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Maurice Miner (J Morrison)	£6.95	£5.50
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New Releases

THE STING

Scorpion is a high speed arcade game for the unexpanded Vic20, which, it is interesting to note, is still outselling the Commodore 64

The player must defend himself from a trail of scorpions As you might expect the setting is the desert, which, aside from the blazing heat, is littered with poisonous cacti

An additional problem is a deadly spider that turns up from time to time, and falling cacti spores that form more cacti and get in your way As you may have gathered, this is basically a version of that old classic *Centipede* but is none the less addictive for all that

Program *Scorpion*
Price *£7 95*
Micro *Vic20*
Supplier *Sumlock*
198 Deansgate
Manchester M3 3NE

CORRECT

Besieged is part of a series of programs from Sulis Software designed to cover in an entertaining way, just about every quirk of English spelling

In *Besieged* you must help a knight enter a castle, across a ravine, by building him a bridge To build the bridge you will have to get the correct spelling of various words

The package contains two cassettes and a short manual The graphics are neatly done and the words in the game are all fairly difficult to spell correctly, or rather are easy to spell incorrectly and it is recommended for ages 15 and above

Program *Besieged*
Price *£8 65*
Micro *Commodore 64*
Supplier *Sulis Software*
C/O John Wiley & Sons
Baffins Lane
Chichester PO19 1UD

HIDEAWAY

Richard Shepherd Software is one of the leading Spectrum adventure game houses Now it is converting many of its best sellers for other machines the latest is *Super Spy* now on the Dragon 32

The game is divided into four sections as you try to discover the location of Dr Death's secret hideaway destroy his missile and save the world

The game is a mixture of text and graphics The first section involves accumulating your necessary weapons and unraveling coded messages to discover the location of the evil Doctor's island

In the next section, you have to explore the island and discover Dr Death's secret hideaway This is followed by a 3D graphic maze which contains the control room Finally, you must discover the code to disarm the missile and save the world Simple, eh — still it's something to put on your CV

Program *Super Spy*
Price *£6 50*
Micro *Dragon 32*
Supplier *Richard Shepherd Software*
Elm House
23 25 Elmshott Lane
Cippenham
Slough
Berkshire

DECIMAL

Cut'n Val is an educational program for the BBC that will test just about any mathematical expression you wish including decimal arithmetic up to six decimal places, exponential expressions, logical expressions, etc

The questions can be run in a test format where both the result and an analysis of the difficult questions are given at the end

It can be adapted for any level of ability from 7 to 16+ It can be run from disc, tape or network on all operating systems

Program *Cut n Val*
Price *£14 50*
Micro *BBC B*
Supplier *MP Software Services*
165 Spital Road
Bromborough
Merseyside L62 2AE

GIANT RATS

The ZX81 is still being manufactured — a surprising and oft forgotten fact in this time of QLs and Adams Moreover, people are still buying it — usually as a 'toe dipped in the water' measure to see how they feel about computing without risking much money

With these facts in mind, some software houses are still producing new software for the machine and some of it is pretty impressive

Forty Niner is a digging game where you must burrow through the earth searching for gold nuggets You must watch out for giant rats and snakes as well as a gremlin who is digging his way though your pile of earth to get at you

The really remarkable thing about the game is that it features hi-resolution graphics just like the Spectrum (although black and white of course) so the rats really do look like rats instead of square tables Highly recommended

Program *Forty Niner*
Price *£5 95*
Micro *ZX81 (16K)*
Supplier *Software Farm*
155 Whiteladies Road
Clifton
Bristol BS8 2RG

A FORTUNE

Cases Computer Simulations are more or less the only company I can think of who have specialised in Simulations — those programs where you try to run a business in the midst of various, computer derived, managerial problems

In *Stock Market* you try to make your fortune out of stocks and shares You can buy up to six different shares and must respond to high and low prices, newsflashes and company reports in deciding when and what to sell or buy

The program can provide graphs of your performance

and will even analyse your mistakes There are three difficulty levels and at the hardest you will really need to think carefully about each decision

Program *Stock Market*
Price *£6 00*
Micro *Spectrum 48K*
Supplier *Cases Computer Simulations*
14 Langton Way
London SE3 7TL

WAR GAMES

Kriegspiel is an elaborate wargame simulation for the Dragon 32 It is set in a mountain and forest landscape and involves two commanders in charge of tank divisions and infantry — the winner is the first one to enter his opponent's capital

The different types of terrain illustrated by differingly coloured hexagons on the screen display have differing properties in respect of attack, defence and movement properties

The game involves all kinds of factors including the weather and your ability to recruit new forces You can play either against the computer or against another player

Program *Kriegspiel*
Price *£6 95*
Micro *Dragon 32*
Supplier *Beyond Software*
Competition House
Farndon Road
Market Harborough
Leicestershire

BLACK BOX

An educational program for the ZX81 might seem a fairly doubtful idea but then again maybe not There must be a lot of homes where the funny black box introduced parents into the world of computing and after they had gone on to higher and more expensive things, the children got the 'toy' ZX81

Hidden Letters is the program and it is a mixture of a word game and an educational program teaching reading and comprehension The tests involved can be adapted for use by any age group from five upwards

Program *Hidden Letters*
Price *£4 95*
Micro *ZX81 (16K)*
Supplier *Poppy Programs*
Richmond House
Ingleton
Carnforth
Lancs LA6 3AN

COMPOUNDS

Which Salt? is an educational program for the BBC that might just manage to educate It contains information on 24 chemical compounds and tests you on them

When the program is run the results of a series of simple chemical tests are given — you have to deduce the compound from the information You can either make a guess or 'run' other tests in order to get more results The more tests you need, the lower your score

The program comes with a sample worksheet which, it is suggested, could be used to work through the results of the tests in the classroom An obvious subject no one else seems to have used

Program *Which Salt?*
Price *£6 95*
Micro *BBC B*
Supplier *Program Power*
Northwood House
North Street
Leeds LS7 2AA

ALIENS

Although you'd have thought that the memory expansion was an inevitable purchase for the Vic20 — in fact there are very few games using the extra 16K

Starship Escape is one of the few, and is called a machine code graphics adventure Looked at more closely it proves to be simply a very complex arcade game in which you must search an alien vessel for the various parts of your own ship which have been scattered around by some nasty aliens

Various baddies (of course) are trying to prevent you from recovering the parts of your ship and will send you back to where you started if they catch you You are helped by K9, the well known copyright infringement, who can attract the baddies towards him, giving you time to make your getaway

Other features in the game include a map of the alien ship and a surrender button if the going gets too tough

Program *Starship Escape*
Price *£9 95*
Micro *Vic20 (16K)*
Supplier *Sumlock*
198 Deansgate
Manchester
M3 3NE

LIME CAKE

Who remembers *Dig Dug?* It was the arcade game of 1982 (well at one point) and involved moving a little man through the earth digging his way to various treats like cherries and other fruit

Now it is available for the Spectrum and is entitled *Dinky Digger* This version has all the features of the original, except the continuous music — which is the Spectrum's fault rather than Postern's

To complete each screen, Dinky has to eat all the goodies and kill all the monsters, the crowning glory being a lime cake at the centre of each screen which marks the entrance to the monsters' lair

With the likes of Ultimate around, no serious software house should be able to get away with anything other than excellent graphics — these though are not too good, looking like compiled Basic

Program *Dinky Digger*
Price *£6 95*
Micro *Spectrum 48K*
Supplier *Postern*
PO Box 2
Andoversford
Cheltenham GL54 5SW

LOGICAL

Micro Drivin is a graphics adventure for the 48K Spectrum It is one of the best I've seen and is as challenging as you could possibly require

The basic plot involves hunting for clues on a mysterious island — it works a little like the tv program *Treasure Hunt* where each clue leads you on to the location of the next

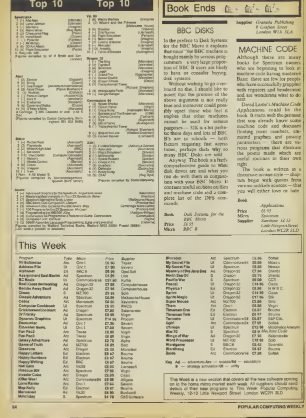
The graphics are superb A major feature of the game is a sports car you use to drive from place to place — the interior of the car is as good as any of the graphics on *Chequered Flag*

Each location is illustrated with the graphics appearing instantaneously on the screen

In terms of the adventure it's as difficult as any I've tried although (with the help of a crib sheet) I can see that all the clues are logical and fair Buy it and see how long it takes you to find the car keys!

Program *Micro Drivin*
Price *£6 95*
Micro *Spectrum 48K*
Supplier *Softel*
5 Durward Drive
Fife

New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12-13 Little Newport Street WC2R 3LD



Top 10

Spectrum*
1 (1) Atic Atac (Ultimate)
2 (4) Lunar Jetman (Ultimate)
3 (–) Stonkers (Imagine)
4 (3) Manic Miner (Bug-Byte)
5 (2) Chequered Flag (Psion)
6 (9) Hunchback (Ocean)
7 ( ) Pyramid (Fantasy)
8 (–) Mr Wimpy (Ocean)
9 (8) 3D Ant Attack (Quicksilva)
10 (6) Flight Simulation (Psion)
* Requires 48K
(Figures compiled by W H Smith and Son London)

Atari
1 (2) Zaxxon (Datasoft)
2 (4) Slinky (Cosmi)
3 (7) Sea Dragon (Adventure International)
4 (3) Astro Chase (Parker Brothers)*
5 (1) Warlock (Callisto)†
6 ( ) Paris in Danger (Avalon Hill)‡
7 ( ) Zork III (Infocom)†
8 (–) Enchanter (Infocom)‡
9 (6) Caverns of Khafka (Cosmi)
10 (5) O'Riley's Mine (Datasoft)
* Cartridge † 32K Cassette or and ‡ 48 K Disc
(Figures compiled by Calisto Computers, Birmingham 021 632 6458)

BBC*
1 (–) Rocket Raid (Acornsoft)
2 (3) Planetoids (Acornsoft)
3 (2) White Knight Mk II (BBC)
4 (–) Monsters (Acornsoft)
5 (10) Disc Doctor (Computer Concepts)
6 ( ) Meteors (Acornsoft)
7 ( ) Missile Control (Gemini)
8 (4) Chess (Acornsoft)
9 (5) Snapper (Acornsoft)
10 ( ) View (Acornsoft)†
† Rom * All Model B
(Figures compiled by Micromanagement Ipswich 0473 59181)

Books
1 (–) Advanced Graphics for the Spectrum *Angell and Jones* (Macmillan)
2 (–) Mastering Machine-code on Your ZX Spectrum *Baker* (Interface)
3 (7) Spectrum Microdrive Book *Logan* (Melbourne House)
4 (4) BBC Micro Disk Companion, *Latham* (Prentice Hall)
5 (3) Advanced User Guide for the BBC Micro *Bray* (Cambridge Micro Centre)
6 (–) 100 Programs for the ZX Spectrum *McLean* (Prentice Hall)
7 (8) Programming the M68000 *King* (Addison-Wesley)
8 (6) Commodore 64 Programmer's Reference Guide *Commodore* (Commodore)
9 (6) Complete Forth *Winfield* (Sigma)
10 (5) 68000 Assembly Language Programming, *Kane and Leventhal* (Osborne)
(Figures compiled by Watford Technical Books, Watford 0923 23004 Prestel 26884)
(Last week's position in brackets)

Top 10

Vic 20
1 (8) Wacky Waiters (Imagine)
2 (2) Wizard and the Princess (Melbourne House)
3 (5) Snooker (Visions)
4 (–) Grid Runner (Llamasoft)
5 (6) Flight Simulation (Fanasoft)
6 (1) Bewitched (Imagine)
7 (3) Catcha Snatcha (Imagine)
8 (–) Abductor (Llamasoft)
9 (10) Arcadia (Imagine)
10 ( ) Tomb of Drewan (Audiogenic)

Dragon 32
1 (–) The King (Microdeal)
2 (2) Eightball (Microdeal)
3 (4) Scramble (Microdeal)
4 (3) Leggit (Imagine)
5 ( ) Grand Prix (Salamander)
6 (1) Space Shuttle (Microdeal)
7 (8) Dragon Chess (Oasis)
8 (7) Transylvanian Tower (Richard Shepherd)
9 (6) Intergalactic Forth (Microdeal)
10 (–) Danger Ranger (Microdeal)

Commodore 64
1 (2) Space Shuttle (Microdeal)
2 (7) Falcon Patrol (Virgin)
3 (1) Crazy Kong (Interceptor Micros)
4 (–) Sorcerer and The Snowman (CBM)
5 (4) Cosmic Convoy (Taskset)
6 (–) Styx (Supersoft)
7 (3) Motormania (Audiogenic)
8 ( ) Transylvanian Tower (Richard Shepherd)
9 (–) Ship of the Line (Richard Shepherd)
10 (5) Hover Bovver (Llamasoft)

ZX81
1 (3) Football Manager (Addictive Games)
2 (1) Asteroids (Quicksilva)
3 (–) Flight Simulation (Sinclair)
4 (–) Mothership (Sinclair)
5 (–) Space Raiders (Sinclair)
6 (–) Chess in 1K (Sinclair)
7 (5) Invaders (Quicksilva)
8 (4) Defender (Quicksilva)
9 (7) Krazy Kong (PSS)
10 (6) ZXAF (Bug-Byte)
(Figures compiled by Boots/Websters)

Book Ends

BBC DISKS

In the preface to Disk Systems for the BBC Micro it explains that since "the BBC machine is bought mainly by serious programmers a very large proportion of BBC B users are likely to have or consider buying, disk systems

Without wishing to go overboard on this, I should like to assert that the premise of the above argument is not really true and moreover could possibly upset those who feel it implies that other machines cannot be used for serious purposes — 32K is a bit pathetic these days and lots of BBC B's are in schools — both factors requiring fast access times, perhaps thats why so many BBC Disks are sold

Anyway The book is a fairly comprehensive guide to what disk drives are and what you can do with them in conjunction with your BBC Micro It contains useful sections on files and machine code and a complete list of the DFS commands

Book *Disk Systems for the BBC Micro*
Price *£6 95*
Micro *BBC B*
Supplier *Granada Publishing 8 Grafton Street London W1X 3LA*

MACHINE CODE

Although there are many books for Spectrum owners who are beginning to look at machine code having mastered Basic there are few for people who have successfully grappled with registers and hexdecimal and are wondering what to do next

David Laine's *Machine Code Applications* could be the book It starts with the premise that you already know some machine code and discusses floating point numbers, animated graphics and passing parameters — there are various programs that illustrate the points made which are useful routines in their own right

The book is written in a discursive arcane style — chapters begin with quotes from various unlikely sources — that you will either love or hate

Book *Applications*
Price *£6 95*
Micro *Spectrum*
Supplier *Sunshine 12 13 Little Newport Street London WC2R 3LD*

This Week

Program	Type	Micro	Price	Supplier
3D Battlestar	Arc	Oric 1	£8 95	Tepaz
Address File	Ut	Oric 1	£7 90	Severn
Alphabet	Ed	BBC B	£9 95	Opal Soft
Assignment East Berlin	Ad	Spectrum	£5 95	Link
BC Basic	Ut	Commodore 64	£57.50	Kuma
Basil Goes Ballooning	Ad	Dragon 32	£7 95	Computerhouse
Bombs Away Basil	Ad	Dragon 32	£7 95	Computerhouse
Chess	S	MZ 700	£9 95	Solo
Classic Adventure	Ad	Spectrum	£6.95	Melbourne House
Cobra	Arc	Memotech	£6 50	Xavieraire
Computer Cookbook	Ut	Spectrum	£5 95	PMCS
Cricklewood Incident	Ad	Dragon	£7.95	Salamander
Dr Franky	Ad	Spectrum	£5 95	Virgin
Dynamic Graphics	Ut	Spectrum	£14 95	Procom
Encounter	Ad	Oric 1	£7.95	Severn
Extended Basic	Ut	Oric 1	£7.50	Severn
Fun Pac2	Arc	Texas	£5.95	Virgin
Fun Pac3	Arc	Texas	£8 95	Virgin
Galaxy Adventure	Ad	Spectrum	£2 75	Alpha
Game of Truth	Ad	MZ700	£8 95	Solo
Glaxxons	Arc	Dragon	£5 00	Microdeal
Happy Letters	Ed	Electron	£8 97	Bourne
Happy Numbers	Ed	Electron	£8 97	Bourne
Happy Writing	Ed	BBC	£8 97	Bourne
Hell Gate	Arc	Vic20	£5 00	Llamasoft
Hideous Bill	Arc	Spectrum	£7 95	Virgin
Invader Cube	Arc	Dragon	£5.95	Oasis
Killer Weel	Arc	Commodore 64	£6 95	Alligata
Lone Raider	Arc	Oric 1	£7 90	Severn
Map Rally	Ed	Electron	£8 97	Bourne
Marooned	As	Vic20	£4 95	Bunlasoft
Matchday	S	Spectrum	£4 78	C&D Software
Microbot	Arc	Spectrum	£5.95	Softek
My Secret File	Ut	Commodore 64	£9.95	Mosaic
My Secret File	Ut	Spectrum	£6.95	Mosaic
Mystery of the Java Sea	Ad	Dragon 32	£7.95	Shards
North Sea Oil	S	Dragon	£6 75	Shards
Pacific War	S	Spectrum	£6 00	CCS
Pascal	Ut	Dragon 32	£14 95	Oasis
Physics 1	Ed	Dragon 32	£8.95	N W B C
Sprint	Ut	Dragon 32	£14 95	Oasis
Sprite Magic	Ut	Dragon 32	£17 95	Silk
Super Mouse	Arc	MZ 700	£3.95	Solo
Them	Arc	Oric 1	£6.95	Virgin
Timeman One	Ed	Electron	£8.97	Bourne
Timeman Two	Ed	Electron	£8 97	Bourne
Tornado	Ut	Commodore 64	£8.97	B&F CBL
Ugh!	Arc	Commodore 64	£7 95	Softek
Ultimon	Ut	Spectrum	£13 95	Microhelics Anonym
War 70	S	Spectrum	£6 9[illegible]	*Machine Code*
Wings of War	Ad	Dragon 32	£7 95	Salamander
Word Processor	Ut	MZ 700	£19 95	Solo
Wordgame	S	BBC B	£5.45	Scientific
Wordhang	Ed	Electron	£8 97	Bourne
Zalda	Arc	Commodore 64	£7.95	Softek

Key Ad — adventure/Arc — arcade/Ed — education/
S — strategy simulation/Ut — utility

This Week is a new section that covers all the new software coming on to the home micro market each week All suppliers should send details of their new programs to This Week Popular Computing Weekly, 12-13 Little Newport Street London WC2R 3LD

Whiz kids

Whiz Kid Genius is Millionaire at eight "We always wanted him to get a paper round like the other lads round here but now we're glad he didn't" said whiz kid Ronny's pretty mother Gladys (28)

Have you ever wondered where all the whiz kids went? Fleet Street used to be full of them Features editors would spend ages dreaming up more puns on the word chip

Hopefully most of the kids made a couple of thousand pounds and are now doing physics or maths at University Hopefully too they are spending some of their free time in less isolated activities than programming computers

Even at the height of the fuss one thing was clear to me from the dozens of programs I am sent every week — with a few exceptions the best were never from lone fifteen year old programmers Even when a marvellous game was written by such a person it was usually from one of the large software houses like Quicksilva where the company could provide advice and equipment to ensure a professional end result.

But even these enthusiastic amateurs are being replaced by highly paid professionals This inevitable change is clearest seen in the Spectrum software market

For complex reasons mainly to do with money and market forces Spectrum software is by and large cheaper and better than the software for any other machine Before writing in to complain take a look at some of games generally available under £6 from Ultimate or Imagine — you'll find it difficult to disagree

What happened and is still happening in the Spectrum market is that as sales of the machine grew the professionals moved in — there was real money to be made Advertising budgets expanded and many small operations that had been previously ticking over with a small profit, started to lose money — they couldn't compete with the high profile, high quality operations

Atari made a lot of mistakes, but putting out poor quality software was not one of them On the contrary, they knew a basic fact at a very early stage — really good games could not be written by one person Too many different and in many ways opposing skills were required Consequently the Atari programmers invariably worked with graphic designers and games designers, who concentrated on the look and 'play' of the game respectively

The same set up is true of the top Spectrum software houses — programs are written by teams rather than individuals

This situation will undoubtedly start to be repeated on other machines which sell well — it is already largely true of the Commodore machines with their large transatlantic user base

It is not so easy to predict the overall effects on the market in say five years time Should we view it with enthusiasm or foreboding?

The quality of the games in terms of use of graphics and sound will undoubtedly go up and prices will probably be standardised at a reasonable level (it could be argued that one of the things Atari did wrong was to sell its games too expensively) Getting hold of the games will be as easy as buying records — with large budgets for advertising and promotion new programs will be 'visible' — no more waiting ages for a response from a mail order company

I see some problems through too What will really be encouraged is standardisation — maximum appeal to maximum numbers of people for maximum profit.

The obvious analogy is with the record business — if you have top 40 tastes you'll be well catered for

What we must hope is that the analogy is actually very precise — in that case just as there is an 'underground' record industry which survives (low budget labels small scale advertising, little radio play), perhaps it is not unreasonable to imagine an 'underground' software industry where small companies grow up to fill a demand for programs outside the norm Maybe they won't have the professional veneer of their popular rivals but if the record industry is anything to go by, they may be far more interesting and imaginative ■

Graham Taylor

On the tiles

Puzzle No 94

I called round to see Albert at his workshop last Saturday to see if he could repair an antique chair that I had acquired When I arrived he was busy working on two matching rather broken down old tables

"I'm only interested in the tops" explained Albert "You see they're covered with square tiles which I am hoping to remove and use to cover a larger table that I have made Each table top was inlaid with very attractive inch square tiles arranged with as many tiles to the row as there were rows

Several weeks later he rang to say my chair was ready so I went straight over "What do you think of my new table?" he asked when I arrived The new table top was covered with the tiles that he had salvaged — again in a perfectly square arrangement

"Unfortunately I broke one of the tiles" said Albert, "but luckily I still had precisely the correct number of tiles left for me to complete the job

How many tiles did he use on the new table?

Solution to Puzzle No 89

From the alphametic *DAYS* *7 = *WEEK* it is clear that *D* must be equal to 1 otherwise there would be more than four digits in the product

The program generates successive values for the word *DAYS* and multiplies this by seven to obtain the product This result is first checked to determine if the second and third digits are the same, and then to see if the digits of the product are different form those in the word *DAYS*

```
10 LET D = 1 20 FOR A = 0 TO 9 30 IF A = D THEN GOTO 210 50 FOR Y = 0 TO 9 50 IF Y = D OR Y = A THEN GOTO 200 60 FOR S = 0 TO 9 70 IF S = D OR S = A OR S = Y THEN GOTO 190 90 LET DAYS = D*1000 + A*100 + Y*10 + S 90 LET WEEK = DAYS * 7 100 LET WS = STR$ WEEK 110 IF WS(2) <> WS(3) THEN GOTO 190 120 IF WS(4) = WS(3) OR WS(4) = WS(1) OR WS(2) = WS(1) THEN GOTO 190 130 FOR N = 1 TO 3 140 IF N = 3 THEN LET N = 4 150 LET K = VAL WS(N) 150 IF K = D OR K = A OR K = Y OR K = S THEN GOTO 190 170 NEXT N 180 PRINT DAYS "*7 = " WS 190 NEXT S 200 NEXT Y 210 NEXT A
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This results in two possibilities 1048 * 7 = 7336 and 1207 * 7 = 8449

Winner of Puzzle No 89

The winner is R A Mitchell, Lingdale Avenue South Bents, Southerland, who receives £10

THE PIMAN, WHOSE ALCOHOLIC BENDER AND SUBSEQUENT MYSTICAL ENCOUNTER WITH THE PYRAMID OF PI INSPIRED 2 GREAT NEW ARCADE STYLE GAMES: PI-EYED AND PI-BALLED (AVAILABLE NOW WITH LADY CLAIR'S FREE HIT SONGS ON THEIR BACKSIDES), IS BACK WITH HIS MATES. YAKZEE YAK HAS TOLD HIM HE MUST TRAIN FOR THE OLYMPICS. PIMAN IS NOT SO SURE...

I DUNNO.. I JUST AINT GOT THE MUSCLE
OH, HIYA, GROUCH! WHAT D'YOU THINK?
I THINK YOU SHOULD TAKE A COLD SHOWER! LISTEN, WE'RE INVITED TO ATTEND THE GOLDEN BALLS COMPUTER SOFTWARE AWARDS NIGHT!
THIS COULD MEAN POSTERITY, IMPORTANCE. AND A NEW DRESS
YOU'D BETTER WRITE US SOME SPEECHES IN CASE WE WIN SOMETHING!

"AND I'M HONOURED TO RECEIVE THIS GLITTERING PRIZE. I'M QUITE AT A LOSS FOR.." WHAT'S THIS WORD?
"WORDS"!

ON ARRIVING, THEY HAVE A LITTLE TROUBLE WITH THE DOORMAN
JUST A MOMENT I WISH TO EXAMINE YOUR INVITATIONS!
THAT'S OKAY BUTTONS. I SUPPOSE YOU NEVER GET ANY OF YOUR OWN!
I'M DYING TO SEE RONNIE RENTASTAR DISHING OUT THE PRIZES!
I REMEMBER WHEN HE WAS A WASHING-UP-MACHINE REPAIRS MAN, AND FIXING OUT THE DISHES!

INSIDE PIMAN'S PALS IN THE INDUSTRY GREET HIM WARMLY..
GOOD TO SEE YOU BACK IN THE PINK
HEY PIMAN-O THE WAGON NOW, EH?
LADY CLAIR, YOU LOOK RAVISHING!
SHH! MR RENTASTAR IS SPEAKING NOW!
WELL, TELL HIM TO SHUSH! WE CAN'T HEAR OURSELVES CREATING A DISTURBANCE!

AND THE GOLDEN BALLS AWARD FOR THE SOFTWARE HOUSE WHICH HAS SPENT THE MOST ADVERTISING MONEY WITH THE ORGANISERS GOES TO..
HEY, GROUCHO-HEAR THAT?
SHH
NO, BUT I SMELL IT!
SHHHH!

WAIT FOR IT.. GOES TO YAWN AND RYPOFF FOR THEIR SUPER PROGRAM TORTURED DEEP FRIED BABIES
WE'RE HONOURED TO RECEIVE THIS GLITTERIN PRIZE WE'RE QUITE AT A LOSS FOR — WHAT'S THIS?
THEY GOT OUR SPEECH!
I GOT THEIR FOUR POUNDS!
WUH.. WORDA? WORDS?

AS THE CEREMONY PROGRESSES, THE PIMAN BECOMES VERY VERY ANGRY
..AND THE GOLDEN BALLS BLOATED CAPITALISTS WHO DON'T GIVE A MONKEYS ABOUT THEIR PUBLIC-AND-MAKE A FAST BUCK AWARD GOES TO-YES! YAWN AND RYPOFF AGAIN FOR THEIR SUPER PRODUCT SAME GAME NEW TITLE!
..WE'RE QUITE AT A LOSS FOR-WORDS?
I CAN'T TAKE ANY MORE OF THIS!!
BUT IS THIS JUST BECAUSE YOU HAVEN'T WON ANY PRIZES?
NO! IT'S NOT THAT - BUT THIS CAN'T CONTINUE!











BY.... NEXT WEEK, THE PIMAN GETS TOUGH!

PHONE LADY CLAIR TO BUY SPECTRUM DISC DRIVES! £260 INCLUDING SECURICOR DELIVE